73 Amateur Radio Today

SEPTEMBER 1993
ISSUE #396
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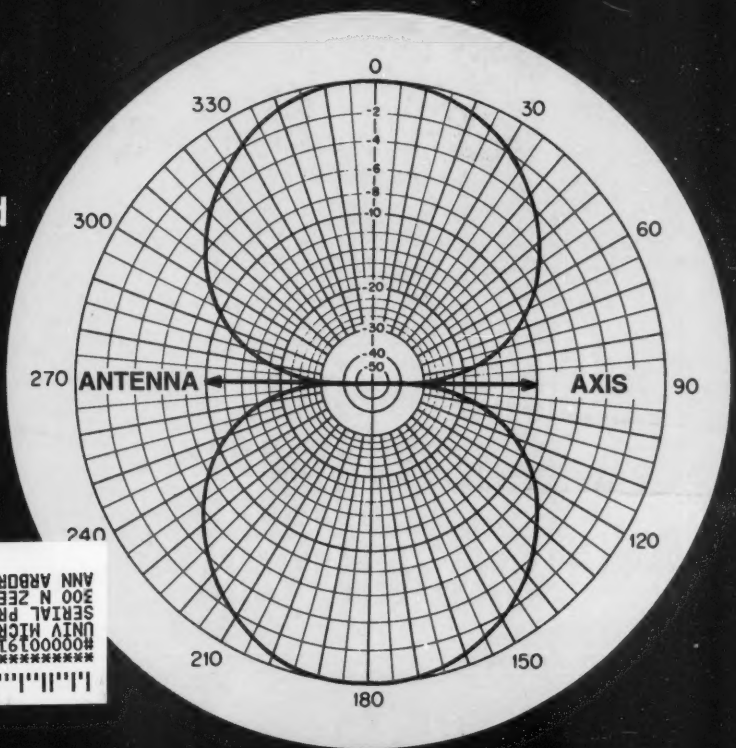
A WGI Publication
International Edition

Special Antenna Issue

7 Great Antenna Projects You Can Build

- Computer-Controlled Beam
- The "Icky-Stick"
- Restricted Space Multiband
- Twisted Loop
- Lazy H
- Design a Discone
- Recycled TV Beam



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CIRCLE 179 ON READER SERVICE CARD

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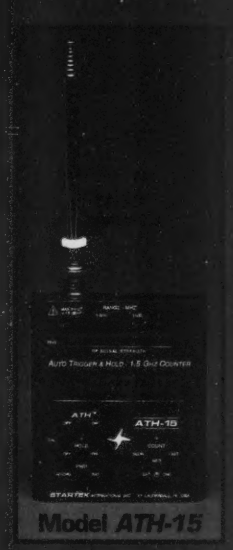

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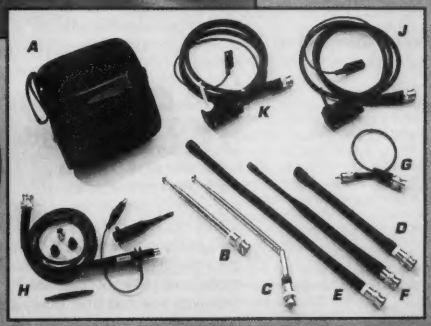

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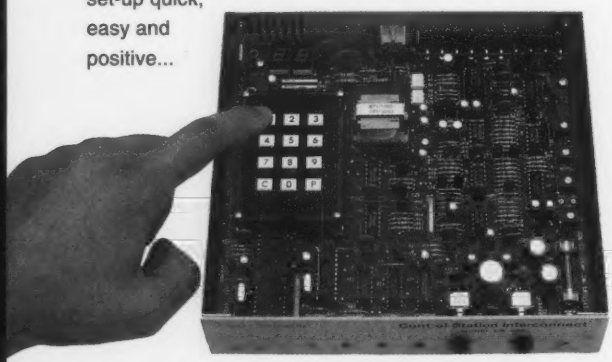

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Private Patch V is a multi-mode interconnect that offers four user selectable modes: 1. Enhanced Sampling 2. VOX Simplex 3. Semi-Duplex 4.Repeater Maker. A 90 memory speed-dialer and remote base mode are also included. Can be connected to the Mic and speaker jacks of any simplex transceiver when used in VOX simplex. Fully FCC and DOC approved. No other patch offers as many modes and features.

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The CS-900 is VOX activated and can be used simplex or through any remotely located repeater. The standard 1/2 Second Electronic Voice Delay totally eliminates syllable or word clipping and results in unsurpassed simplex performance. A 90 memory speed-dialer and Remote base mode are also included. The only required connections are to the Mic and Speaker jacks of your simplex transceiver. Fully FCC and DOC approved. This is the best deal going in a simplex patch!

CS-800 Full Duplex Interconnect

The CS-800 will operate Full or Semi duplex and also has a built-in Repeater Maker. The only required connections are to the Mic and Speaker jacks of your dual band transceiver. A 9 memory Speed-dialer is standard. Fully FCC and DOC approved. This is your best choice in a Full Duplex Interconnect with built-in Repeater Controller!

CS-700 Intelligent Interconnect

The CS-700 is for simplex operation and offers selectable VOX Enhanced or VOX Controlled Sampling. Sampling allows the mobile operator to have positive control at all times. The CS-700 requires an internal connection to the discriminator of your simplex transceiver. A 9 memory Speed dialer is standard. This is the best sampling patch in the business!

CD-1 Communications Decoder Unit

Decodes and displays all 50 CTCSS tones, 104 DCS codes and all 16 DTMF digits when connected to any scanner, receiver or service monitor. Extremely useful for service work or determining the correct codes to operate open repeaters and autopatches. DTMF sequences are displayed a second time, slowly just in case the real time digits were too fast to comprehend.

CIRCLE 12 ON READER SERVICE CARD

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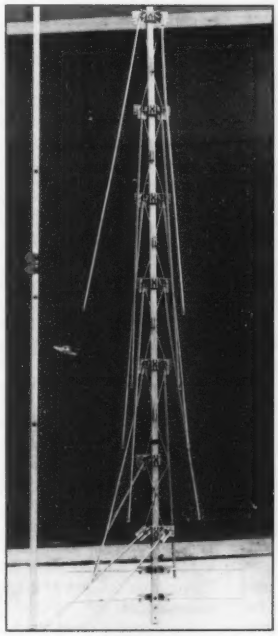

Turn this pile of junk into a 2 meter beam for $2. See page 34.

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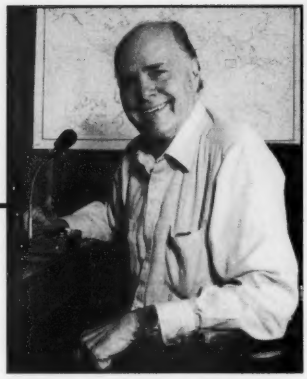

Vox Pops

A letter from Richard KC4YQL got me to thinking. Now, you know that's gonna make trouble. And sure enough, trouble it is. But I think you're going to like it, if you're just a bit anti-establishmentarian. As an admitted proponent of disestablishmentarianism, I hope you go for it.

Richard made the usual mistake of coming up with a good idea and proposing it to the ARRL. Now you'll find no one more enthusiastic and supportive of the wonderful works being done by our esteemed League than your semi-humble servant. But, even in my unabashed admiration for the Newington Marvel, I do occasionally admit to some of the very slightest of misgivings about their bureaucracy and inertia, which in rare instances can give one the impression we're trying to deal with a federal agency. I'm always saddened when the true worshippers of our Radio Relayers blow my slightest of criticisms totally out of proportion, often subjecting me to outrageous vilification and slander. But that's in the same vein as Rushdie's problem with the equally religiously obsessed ayatollahs of Iran.

That aside, let's get down to brass tacks. No, I can't put that all aside yet. Sorry. But Richard's proposal has a lot to do with what a few malcontents perceive as a weakness on the part of the League. Heresy, of course, but these things have to be faced and resolved. It has to do with the false perception that the League's Board of Directors is far more involved with carrying messages from headquarters to the unwashed than in carrying the wishes of the unwashed to those high on Olympus . . . known locally as Newington.

Why not, begged Richard, let us lowly members comment on proposed rule changes before a firm position is taken before the FCC? Well, of course we old-time members know that we always have the right to write and express our opinions to HQ. Of course, I can't recall any instance, at least in the 50 or so years I've been a member, when these comments were taken into consideration. But that may be due to the admittedly faulty memory of a doddering old-timer who is gradually slipping into the pre-senility stage. That's what happens when one retires and has too much time on one's hands.

But I happen to like the basic idea. In fact, why not take this one step further? Instead of coming up with good (and bad) ideas for rule changes and then dropping the ball . . . or far worse, sending them to the FCC . . . how about our starting a Vox Pops section in *73* where your proposals can be exposed for the brilliance or the stupidity they represent? We'd print 'em and the readers would then have an opportunity to congratulate you for your brilliance or vent their spleens over your incredible ignorance. The end result would be a reader poll. Those with enough support would be forwarded to the FCC for action and the rest would be given at least a decent burial.

Now, I know this whole concept is going to give the ARRL Board members fits. Only the League is supposed to interface with the FCC. All of us hams are supposed to first get the ARRL to agree with our proposals and then let them take it from there. Alas, the League's past record on reflecting the actual wishes of the members hasn't been exemplary, tending more to represent the interests of the Directors and those we've elevated via the Board to Olympus. I still vaguely remember the many years I fought the ARRL to get FSK permitted below 2m. They put up one hell of a battle, but they eventually lost.

The League, bless them, seems firmly rooted in the past. CW, that fascinating artifact from the 19th century, is obsessive. Many of us are eagerly awaiting a carbon dating report on test equipment discovered in the ARRL lab.

So, if you have some ideas for rule changes that you think are important, let's send them up for some flak from our inexhaustible supply of negative old-timers, who are against almost any changes, no matter how needed. If, after the smoke clears, the readers give a thumbs up vote, we'll submit your gem to the Commission and cross our collective fingers. How's that play for you?

So let's see some samples of your genius coming in to Vox Pops, *73 Amateur Radio Today*, Peterborough NH 03458-1107. Maybe we can get this confounded hobby into usable shape yet.

Calling All Entrepreneurs

A note from Al Warsh N6UHF brought an article in the April *Mensa Bulletin* to my attention. It had to do with the need for a better avalanche beacon transmitter for skiers who get their jollies skiing in avalanche-prone areas. It seems that the current crop of such devices left enough to be desired so no one was able to locate a chap (or his body) who was in the wrong place at the wrong time last winter.

My advice is to take up downhill skiing and try to stay on the trails. This has been my approach and it's worked perfectly for me in 25 years of skiing. Yes, I know it's more expensive . . . unless you're my age and can ski free most places . . . but it is safer and more exciting. Oh, I tried cross-country skiing. Bor-ring. I haven't seen my cross-country skis, boots, and collection of waxes recently, so some past employee is probably enjoying them. Or has sold them.

If you're into experimenting, you might want to see what you can do. You want to find out what the current crop of beacons do, so you can do much better. I wish I'd saved some of the snow from last winter to help you experiment. We had plenty along in March. You need to find out what frequencies can get through about six feet of snow and for what range. Then you have to package the transmitter so it doesn't take a dog-sled to cart the power supply.

Once you have a nice small package and a manufacturing facility, if you don't have the money to finance the project you then have to find a venture capital outfit that will fleece you of everything in short order. They'll move the manufacturing to Taiwan, where copy-cat firms will clone the product, quickly putting the venture capital firm out of business. You'll end up with the comforting knowledge that it's your invention that's selling to millions of cross-country skiers through Eastern Mountain Sports and other ski outfitters.

While on the topic of entrepreneurialism, several readers of my book, *Declare War*, have mentioned that they've found it a gold mine of entrepreneurial ideas. Of course. I can't help coming up with more and more ideas for ways to make money. If you've bought the book perhaps it's time to sit down and start reading it. But then you probably have your ear plugs screwed in tightly so as not to be annoyed by knocks on the door by Opportunity. Well, it's a lot easier to buy lottery tickets than to work, anyway. Unfortunately, the only number of yours that's likely to come up will be that one on your ARRL Silent Key certificate. I'm not sure if you have to be a member to get that award or not. Better join, just in case, right?

Gloom and Doom Revisited

Is technology about to eliminate the major excuse for amateur radio's existence? We've been buffeted by technological developments ever since WWII. First there was the transistor, a newfangled contraption most old-timers never really quite got used to. And if that wasn't bad enough, then they began cramming parts on boards instead of on a chassis. Worse, then they shrunk the boards and transistors down to quarter-inch-square integrated circuits. By this time most hams had bailed out.

If we'd kept kids coming into the hobby we might have bridged the gap. Kids, not having been brought up on tubes, resistors, tuning capacitors and output transformers, were comfy with gates and phase-locked-loops. Alas, we zapped the kids in 1964 and they've never really come back.

So here we are in the '90s, with synthesized HTs and TNCs, and for most of us not a clue as to what's going on inside our predominantly black boxes. CW was replaced in the real world a generation ago by high-speed digital communications systems and facsimile. Now, when our rigs break, we don't get out a soldering iron, we get out the shipping box and call UPS.

No longer are we a technically educated resource for use in time of war. No longer are we inventing and pioneering new technologies as we did 50 years ago. We're not even doing much of value as good will ambassadors. Our one remaining claim to our billions of dollars in publicly-owned frequencies is our ability to provide emergency communications.

Some of our clubs are doing a fine job of this. They're outfitting emergency vans and have emergency-powered repeaters either in place or ready to set up. They're set to help different services intercommunicate. And they're able to provide short-, medium- and long-range communications by virtue of our many ham bands. Now, I admit it's true that most of our emergency communications systems are as slow as Gettysburg and prone to endless errors. Many of them are still rooted in the glorious 1930s, using CW and voice. But we do have a growing number of more modern systems using packet, digipeaters and networks. We have a few hams who are doing their best to set up these faster systems, despite endless interference from the officials of a national ham organization which I won't mention, for fear of being accused of trashing them, forsooth.

Continued on page 74

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MODERN, MULTI-BAND ANTENNA SYSTEMS

Modern, high-performance stations use COMET Antennas, Duplexers, Triplexers and Accessories! COMET products are designed to provide an exceptional level of signal quality and coverage area. Whether operating mobile or from your base station, COMET products make you sound good. No other product line has the selection, convenience, quality and performance!

NEW

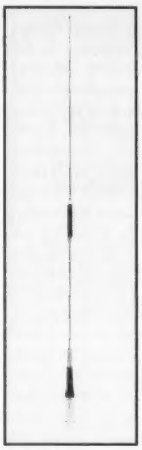
SB-5/SB-5NMO
Dual-Band 146/446MHz
Gain & Wave:
146MHz 3.0dBi 1/2 wave
446MHz 5.5dBi 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 120W FM
Length: 38"
Connector: PL-259 or NMO style

NEW

SB-7/SB-7NMO
Dual-Band 146/446MHz
Gain & Wave:
146MHz 4.5dBi 6/8 wave center load
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 70W FM
Length: 4' 7"
Connector: PL-259 or NMO style

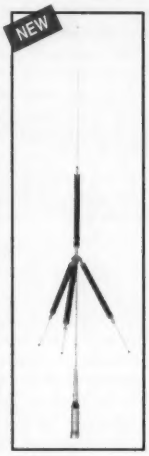
B-20/B-20NMO
Dual-Band 146/446 MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
446MHz 5.0dB 5/8 wave x 2
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 30"
Connector: PL-259 or NMO style
Construction: Black, w/fold-over w/Fold-Over

B-10/B-10NMO
Dual-Band 146/446 MHz
Gain & Wave:
146MHz –dB 1/4 wave
446MHz 2.15dB 1/2 wave
VSWR: Less than 1.5:1, 144-148MHz, 440-450MHz
Max Power: 50 watts
Length: 12"
Connector: PL-259 or NMO style
Construction: Black, cellular look-a-like w/Fold-Over



CX-224/ CX224NMO
Tri-Band 146/220/446MHz
Gain & Wave:
146MHz 2.15dB 1/2 wave
220MHz 3.6dB 5/8 wave
446MHz 6.0dB 5/8 wave x 2
VSWR: 1.5:1 or less
Max Power: 100 watts
Length: 3'
Connector:
CX-224 PL-259
CX-224NMO NMO Style

NEW



HA4S
Quad-Band HF Mobile
7, *14, 21, 24, 28MHz
Wave: 1/4 wave
VSWR: Less than 2:1
Weight: 1 lb. 14 ozs.
Length: 4' 4"
Connector: PL-259
Construction: Heavy Duty, w/Fold-Over
***L-14HS:** Optional 14MHz Coil

NEW

FJ-15S
Tri-Band Mobile
50/146/446MHz
Gain & Wave:
50MHz 2.15dBi 1/4 wave
146MHz 4.5dBi 5/8 wave center-loaded
446MHz 7.2dBi 5/8 wave x 3
VSWR: 1.5:1 or less
Max Power: 120 watts FM
Length: 4' 10"
Connector: PL-259

CHL-185
146MHz
Gain & Wave:
4.1dB 5/8 wave
VSWR: 1.5:1 or less
Max Power: 200 watts
Length: 4' 8"
Connector: PL-259

NEW

CH-722SA
146/446MHz HT Antenna
Gain & Wave:
146MHz 3.0dB 1/2 wave
446MHz 5.5dB 5/8 wave x 2
Max Power: 50 watts
Length: 35' 4"
Weight: 3.9 ozs.
Connector: BNC

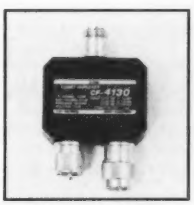
NEW

SH-55
146/446MHz HT Antenna
Gain & Wave:
146MHz 1.5dBi 1/4 wave
446MHz 3.2dBi 5/8 wave
Max Power: 10 watts
Length: 15.5"
Connector: BNC

CH-32
Miracle Baby 146/446MHz HT Antenna. Compact design, the smallest HT antenna available!
Gain & Wave: 0dB
VSWR: 1.5:1 or less
Max Power: 10 watts
Length: 1.75"
Connector: BNC

RS-21
Trunk, hatchback, rear door (van, blazer, etc.) mount. Adjustable to virtually ANY angle. Rubber-coated base protects vehicle paint.

RS-820
Heavy-duty low profile trunk lip or hatch back mount. Rubber coated base protects vehicle paint.



CF-4160K, CF-4160I, CF-4160J
146/446 MHz
Band Pass, Ins. Loss, Max Power:
1.3-150MHz, 0.1dB, 800w PEP
400-540MHz, 0.2dB, 500w PEP
Isolation: 60dB
CONNECTORS:

	CF-4160K	CF-4160I	CF-4160J
Output:	SO-239	SO-239	SO-239
Low In:	PL-259	PL-259	SO-239
High In:	PL-259	N-Male	SO-239

3D4M Standard Cable Assembly
13.5 feet of low loss coax. Gold plated UHF (PL-259/SO-239) connectors.

3D5M Standard Cable Assembly
Same as 3D4M, but 17 feet of coax.

CK-5M Deluxe Cable Assembly
13 feet double shielded very low loss coax. + 12" RG-188 teflon coax. Gold-plated UHF (PL-259/SO-239) connectors. Allows easy entry from a lip-mount w/o causing coax or weather strip damage.

CK-5M5 Deluxe Cable Assembly
Same as CK-5M, but 17 feet of coax.

CROSS NEEDLE METERS

- Separate Meter and RF Sensor allows for convenient placement of the meter.
- Cross Needle Meter provides FWD, REF, and VSWR simultaneously.
- The RF-Sensor is a compact design, and has an extremely low-loss circuit.
- Beautifully illuminated when connected to power supply.
- 6 foot cable standard.
- Optional EXS-3 10 foot extension cable for a total of 16 feet between the sensor and meter.

COMET products are available from most major dealers. For customer service, or a complete catalog, please call us at 800/962-2611. We're confident COMET products and accessories will enable you to enjoy Amateur Radio to its fullest!

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CIRCLE 54 ON READER SERVICE CARD

LETTERS

Number 2 on your Feedback card

From the Hamshack

Rickey Nievera N2MBC, Carle Place NY Wayne, keep up the good work. I wonder if you will change the makeup of *73 Magazine* to less kit building and more about ham radio operations, hints, kinks and the like? How about a "sermon" on how we can rebuild the "image" of hams: stopping the chaos on 20 meters, encouraging more activity in public service, volunteering in schools and in Boy Scout programs? Hams should be good citizens and not enemies of their neighborhoods because of TVI. Good neighbor relations should be stressed. Hams need to read more about preventing TVI, RFI, and telephone interference, and should ease up on power amplifiers during popular TV hours and on weekends. The rule is if you have a good contact (at least 5/7) there is no need to use a linear amplifier. Give the hams on low power a chance to get on the air. The guys with big console linears wipe the rest of us out. It's not fair! At least 80% of us use no more than 100 watts. The culprits are the Extra Class hams. Come on—let's get together and behave. Follow the rules and regulations. Let's have less bullshit talk on the ham bands. No politics. Let's talk about technical items, computers and the like. Please—no politics over ham radio.

I have been a ham for over 25 years, as DU1EN, and now as N2MBC. I enjoy DX, not hearing about the country's problems and so forth. I usually hear some hams that I know from way back and we ragchew about the old times. That is ham radio—friendship, learning about geography, etc., not too much foolish talk. Let's all enjoy this hobby—it is a great one—and not spoil it.

You're probably right, Rickey. We should not be discussing politics or religion over the air. As Arnold Glasow said, "The fewer the facts, the stronger the opinion," so arguments about religion, where facts are nonexistent, are fruitless. And political arguments seem to seldom be based on any firmer ground, so let's avoid talking about the deficit, unemployment, welfare, racism, our lousy school system, crime, drugs, the recession, Congressional pork and bribes, Clinton, Rodham, Perot, and other such political matters. Why am I reminded of The Pirates of Penzance, *where the chorus sings, "Let us compromise, (our hearts are not made of leather). Let us shut our eyes, and talk about the weather. Yes, yes, let's talk about the weather. How beautifully blue the sky, the glass is rising very high, continue fine I hope it may, and yet it rained but yesterday. Tomorrow it may pour again (I hear the country wants some rain), yet people say, I know not why, that we shall have a warm July." . . . Wayne*

Michael Graham, Baton Rouge LA I am writing in response to Jeff Carter KK6RY's letter (July 1993) as I await the arrival of my callsign from the FCC after having successfully completed the no-code Tech exam. I've read Carter's letter a number of times, becoming angrier each time. He seems to have some horrible need to feel superior to somebody, and has apparently directed his pseudo-superiority attitude toward the no-code Techs, who he feels will turn the 2 meter and 70 cm bands into some not-so-glorified channels resembling CB. Perhaps he has a poor concept of human nature. An exam demonstrating a degree of knowledge must be taken and passed. CBers just aren't going to do that. They haven't in the past, they don't now, and they're not likely to expend that energy in the future.

The no-code route into amateur radio was, I believe, designed to bring into the fold people like me—educated, reasonably intelligent, and who possess some knowledge of computers. I can't, of course, speak for all no-code Techs, but personally I'm already reading and learning, and eventually will achieve Extra Class. Carter's attitude toward us is the kind of elitism that cannot help but damage efforts to promote amateur radio.

I am angriest when Carter writes, "Let the no-coders run the local bicycle races and show off with their $500 handie-talkies." Carter apparently has no use for public service. It's called giving something back. It's called serving your community. Baton Rouge just finished hosting the National Senior Olympics—successful in large measure due to the efforts of many amateur operators using a 2 meter repeater, their skills in communication, and a whole lot of their personal time.

I regret that Carter feels superior to me, and that I'm not good enough for him. If I run across his call on the air in the future, he'll not have to worry about wasting time communicating with me. I'll be too busy talking with people who care.

Clyde D. Nimal N8YBK, Columbus OH The letter by Jeff Carter in your July 1993 issue really burned me up. It is obvious to me that he doesn't know what he is talking about.

I have been licensed twice: once under the "old" system, where knowing the code was mandatory, and again under the new system.

While I felt that the old system was harder to work with, it did maintain a certain technical edge and launch many an electronics career, mine among them. I had little difficulty learning the code and eventually got a General Class ticket. But I remember well one poor chap who struggled mightily just to be able to tell the difference between a dit and a dah. For him, being tone deaf, this was a mountain to climb, not a hurdle to jump. To him, the present system would have been a godsend. I cannot help but wonder how many other potential hams we lost due to this one barrier.

It is equally obvious that because Mr. Carter has opted to not use VHF anymore, that he is missing out on a fact that makes his whole argument moot. There are quite a few of those "handie-talkie appliance operators" learning Morse code and upgrading. Every one of them has a no-code license, and one of them is hearing impaired! As one of the net control operators of the local CW practice net, I am well aware of the desire of these newcomers to upgrade and get on the HF bands.

Overall, I think that amateur radio will survive quite well with this new generation of hams, code or no code.

Steven L. Sanders N4WAK, Clearwater FL Wayne—I just finished reading your editorial in the June 1993 issue—sure am glad that I'm only an Advanced Class and not an Extra! You're always mentioning the 14,313 mess and I think that it is time to recognize another frequency as being possibly the second-worst for intentional interference . . . 14,230. I am an avid SSTVer and am constantly amazed at the amount of amateurs who persist in using 14,230 as the national tune-up frequency, even when there are at least four or five stations actively talking or sending SSTV images that anyone with a piece of wire for an antenna would hear (if they listened first).

You also solicited comments from those of us who have purchased a new piece of equipment on what we have gone through getting it to operational condition. I have always leaned towards the purchase of ICOM gear, both for VHF/UHF and HF, and have recently purchased a new ICOM IC-W21AT dual-band handie. The radio is excellent and operates as well as the IC-W2A that it replaced. It takes awhile to learn all the bells and whistles even though it has an "AI" button for those of us who need some artificial intelligence.

I am very happy to see that companies like W & W Associates have come out with "universal" chargers that are capable of being fitted with a reasonably priced adapter so it can be used with a variety of radios. One of my major gripes over the last couple of years has been the ridiculous cost of a rapid charger for amateur handie-talkies. I mean, come on, get serious . . . you can buy a 9.6 volt rechargeable drill with a battery pack and a quick charger for around $50 at any hardware store, so why does an amateur charger have to cost so much? You always hear the old song and dance about how small the amateur community is versus any other consumer base and how they have to charge more, etc. I think they know that most people who buy an HT will also buy a rapid charger (for obvious reasons) and it's just their way of showing us how much they appreciate taking our hard-earned money.

I want to thank you for the articles you have published in the last year or so dealing with amateur slow-scan TV. The number of people on 14,230 and 14,233 using the SSTV mode has increased faster in the last year than in all of its previous years. Now, if we can just educate the rest of the amateurs out there and make them realize that we need a good 5 kHz of band above and below these two frequencies it would be great. We voluntarily constrain ourselves to operating SSTV and FAX modes on just these two frequencies on 20m and we could just as easily go anywhere and do it but we don't—we respect the rest of the ham population. Hopefully, we will soon be using advanced digital modes for transmitting images and possibly linking the sending and receiving stations and using error-correction, but right now it's more like RTTY than AMTOR.

Good luck and keep on fighting! I don't always agree with everything you say in your editorials but I never fail to come away thinking, "What if he's right?" Glad to see someone always taking shots at the ARRL, they need someone to snap at their heels and keep them (somewhat) in line!

Ed Campbell KD4SMQ, Macon GA As a new no-code ham, I subscribe to several magazines, including *73*. When you asked for information on how we liked our new equipment, I thought I'd write with my experience.

Like many new hams, my first radio choice was an HT. Nothing gets you "on the air" as quickly or as cheaply. I purchased a Standard 168 and really love it. It is very well-built; I have even dropped it onto a concrete floor with no damage. At home I connect it to an attic antenna and power supply. I also use it with a mobile mag mount, but often I just carry it in the car with the rubber duck and hit the local repeater just fine.

I am working on the 5 wpm code to obtain my Tech Plus, but I must admit that it is not much fun and I often wonder, "What's the point?" Unless you can copy 13 wpm, there is little HF voice available to the new ham.

Question: With all the new no-code hams out there, why don't the manufacturers produce 6 meter rigs? a 2m/6m dual-band mobile would interest me.

Thank you for your magazine. How about some articles on 6m fun? 73

Low Cost GaAsFET PREAMPS

LNG-(*)

ONLY **$59** wired&tested

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 48-56, 137-152, 152-172, 210-230, 400-470, 800-960 MHz.*

LNW-(*) MINIATURE PREAMP

ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

***ONLY* $89 kit, $119 wired&tested**

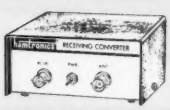
- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

HELICAL RESONATOR PREAMPS

- GaAs FET preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), *$80 vhf, $110 uhf.*** **Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

RECEIVING CONVERTERS



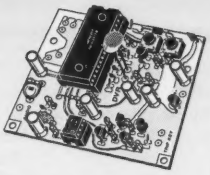
Low noise converters to receive vhf and uhf bands on a 10M receiver.

- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**
- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

ACCESSORIES



NEW DVR-1 DIGITAL VOICE RECORDER Module. Primarily a **voice ID'er for repeaters**. May also be used as a **contest CQ caller** or as a **"radio notepad"** to record up to 20 seconds of received transmissions for instant recall. As a **repeater ID'er,** it will record your voice, using either the built-in microphone or an external mic. It can be used with almost any repeater COR module. As a **contest caller,** you can record a message or even several messages and play them through your transmitter at the press of a switch. As a **radio notepad,** you can keep it wired to the audio output of a receiver ready to record up to 20 seconds of anything you might want to recall later. Play it back as many times as you like through a small external speaker. (Call for more information.) .....kit $89, w&t $139

TD-3 SUBAUDIBLE TONE DECODER/ ENCODER. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions ....kit $29, wired & tested $69

COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier ..... kit $49

CWID. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... kit $59

COR-4. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call ..... kit $99, w&t $159

TD-2 TOUCH-TONE DECODER/CONTROLLER. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired & tested $149

NEW TD-4 SELECTIVE CALLING Module. Economy touch-tone decoder with 1 latching output. Primarily designed to mute speaker until someone calls you by sending 4-digit tt signal but may also be used to turn on autopatch or other device..... kit $49, w&t $89

AP-3 AUTOPATCH. Use with above for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver ..... kit $39

MO-202 FSK DATA MODULATOR. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. ..... kit $49, w&t $79

DE-202 FSK DEMODULATOR. For receive end of link. ..... kit $49, w&t $79

9600 BAUD DIGITAL RF LINKS. **Low-cost** packet networking system, consisting of MO-96 Modem and special versions of our 144, 220 or 450 MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

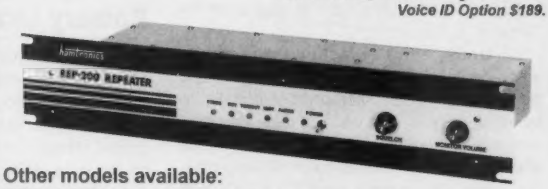
NEW **Real-Speech Voice ID Option Available With DVR-1 Digital Voice Recorder Shown At Left!**

REP-200 REPEATER

A microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

We don't skimp on rf modules, either! Check the features on R144 Receiver below, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

Kit $1095; w&t only $1295!
Voice ID Option $189.



Other models available:

REP-200V Economy Repeater. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

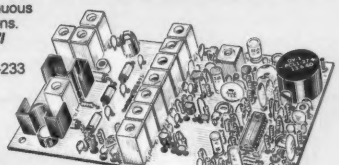
REP-200N Repeater with no controller. For use with external controller, such as those made by ACC. **Kit only $695, w&t $995.**

- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- *FCC type accepted for commercial service (hi-band and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 20W 50-54MHz; 15W (25W option avail.) 143-174MHz; 15W 213-233 MHz; 10W uhf; 10W 902-928MHz.
- Available add-on PA's **up to 100W.**
- **Six courtesy beep types**, including two pleasant multi-tone bursts.
- **Open or closed access autopatch, toll-call restrict**, auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- Pulse (rotary) dial option available.
- **DTMF CONTROL:** over 45 functions can be controlled by dtmf command. 4-digit control code for each function.
- **Owner can inhibit** autopatch or repeater, enable either open or closed access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options.
- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters.**
- Many **built-in diagnostic** and testing functions using microprocessor.
- Color coded **LED's indicate status** of all major functions.
- **Welded rf-tight partitions** for exciter, pa, receiver, and controller.
- 3½ inch aluminum rack panel, finished in eggshell white and black.

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

Also available in rf-tight enclosures, and with data modems.

FM EXCITERS: 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l high band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
- **TA901**: 902-928 MHz, (0.5W out); w&t $219.
- **VHF & UHF AMPLIFIERS.**
- For fm, ssb, atv. Output levels from 10W to 100W. Several models starting at $99.

FM RECEIVERS:

- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift. ...kit $149, w&t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w&t $219.
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion, GaAs FET front end. ...$169, w&t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w&t $219.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w&t $219.

- **Buy at low, factory-direct net prices and save!**
- **For complete info, call or write for free catalog.**
  Send $2 for overseas air mail.
- **Order by mail, fax, or phone** (9-12 AM, 1-5 PM eastern time.)
- **Min. $5 S&H charge** for first pound plus add'l weight & insurance.
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QRX . . .

Nervous Habit

The Associated Press reports the mystery of an electrician's lead poisoning was solved when the man revealed he enjoyed chewing bits of plastic coating he stripped off wires. A routine blood test indicated 48-year-old Elmer Galbraith, who lives near Johnstown, Ohio, suffered 10 times the normal lead level for humans.

Galbraith knew something was wrong when he sensed a tingling in his fingers and began suffering from memory loss and diminished math skills. The unusual case was documented in a government report which issued a warning about the hazards of chewing plastics which may contain lead. *TNX A.P./Scott Schram KN4L.*

Windy City Scanners Safe

Members of the Chicago Area Radio Monitoring Association are breathing a collective sigh of relief after waging a successful battle against the Chicago Scanner Bill. Jon Peterson N9OUM contacted this publication back in July when he found out members of the Chicago Board of Aldermen had proposed passing an ordinance which would have made owning a scanner a crime.

The names and addresses of these aldermen and details of their proposal spread like wildfire to computer bulletin boards across the country—including the *73 BBS*. Jon reports that the response was impressive enough to cause the Chi-town leadership to do an about-face on the issue. The revised ordinance proposal punishes only those individuals who use scanners to commit crimes or interfere with police. A pat on the back for those who wrote letters. *TNX N9OUM/The Chicago Area Radio Monitoring Association.*

Mega-Telescope

The largest single integrated astronomical instrument in the world formally entered service on August 20, when the Very Long Baseline Array (VLBA) was dedicated at ceremonies in New Mexico. The continent-wide radio telescope system is the culmination of a half-century of development in radio astronomy.

The VLBA offers scientists the most detailed views of celestial objects available from any telescope on earth or in space. With 10 receiving stations distributed across 5,000 miles of US territory, its radio vision is sharp enough to read a newspaper in New York from the distance of Los Angeles.

To make images of astronomical objects, the VLBA uses ultra-sensitive radio receivers, superfast tape recorders, atomic clocks accurate to within one second in a million years, and a high-performance computer that can perform 750 billion computations per second. The project is funded by the National Science Foundation. *TNX National Radio Astronomy Observatory.*

Quick Charger Extends Battery Life

A small Austrian company—*Enstore R&D GmbH in Graz*—has come along with a quick charging technology which not only does not harm batteries, but may actually extend their usable lifespan. A new chip is used to monitor the state of the battery's charge during the recharging process. Doing so allows the charger to feed the battery as much current as it can handle without causing heating or gassing.

The Enstore electrode-specific charging system (ECS) is touted as the solution for the dreaded memory effect suffered by NiCd batteries. Enstore claims the ECS can extend the useful life of a NiCd battery to 5,000 charge-discharge cycles from a typical average of 500 cycles. Application for the new technology is likely to spread from small hand-held electronic devices to electric cars. *TNX The Institute of Electrical and Electronics Engineers:*The Institute *Vol. 17, July/August, 1993.*

WACO Hams

At least two licensed amateur radio operators are now believed to be among those killed in the Branch Davidian Compound fire near Waco, Texas, on April 19. The FBI has identified Jeffrey C. Little and Douglas W. Martin as being among the followers of cult leader David Koresh who perished after the coumpound was set ablaze.

Koresh is believed to have set fire to the compound rather than surrender to the FBI after a prolonged armed standoff. Little AB5KZ and Martin AB5LA had both upgraded to Amateur Extra Class on February 23rd of this year. *TNX Westlink Report, June 25, 1993.*

Ticket Time

The FCC's enforcement division has been busy lately. Three Los Angeles area amateur radio equipment dealers have received Notices of Apparent Liability (NALs) in the amount of $7,000 each for marketing the Kenwood TS-50S HF Transceiver which could be ". . . operated on frequencies not authorized for amateur radio use." The complaint apparently stems from a brochure which originaly mentioned the rig's ability to operate above and below the ham bands. This brochure has since been reprinted showing only the rig's ham band capabilities.

Four out-of-band CB operators are being fined from $2,000 to $3,500 each for their infractions. A fat $10,000 fine has been levied against Lonnie N. Gwinn of Federal Heights, CO, for selling external CB RF power amplifiers at a truck stop.

Margaret G. Taylor of Windermere, FL, was told she owed the government $2,000 for her unlicensed amateur radio operation.

Four computer companies were ordered to cough up from $7,000 to $10,000 each for marketing personal computers which did not have the proper FCC equipment approvals.

The Southern Railway Company was fined $7,000 for refusing to allow an FCC inspection of their radio base station. *TNX W5YI Report, Issue #14, July 15, 1993.*

CQ Taxi!

The New York City Taxi and Limousine Commission has decided to ban the use of ham radio as a means of communications for Big Apple cabbies. The measure prohibits the permanent installation of amateur transceivers or accessories in NYC Medallion taxicabs.

The ruling was an apparent response to a bid by a trio of New York City drivers to equip every cab in Metropolis with ham radio. Local repeater groups joined the influential trade publication *Driver* in opposition to the proposal.

Drivers may still carry low power handhelds for personal communications during off duty times outside the cabs, but they must be turned off and kept out of sight while the taxi is in service. *TNX Westlink Report, No. 652, June 25, 1993.*

Israeli Hamsat Launch

The Israel Polytechnical Institute will launch its first satellite known as the *Gerwin-1* (formerly *Techsat-1*) from the Baikonur spaceport in Kazakhstan aboard a Russian rocket. Professor Guiora Shaviv, Director of the Space Research Department, said the satellite will weigh about 60 kg and will carry a packet BBS for ham radio operations.

The satellite from "Technicon," as the institute is known throughout the world, was a project which began three years ago and will be placed in orbit as a secondary payload along with a Russian satellite and a German satellite. *TNX Westlink Report No. 652, June 25, 1993.*

TNX . . .

. . . to all our contributors! 73

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Computer Control for Beam Antennas, Part 2

Completing the project.

by Ron Cole K4OND

In Part 1 we reviewed how antenna rotators work, how to build a simple manual rotator control, and how to get a position readout in electrical form. We can now proceed to the ultimate—complete computerized control of azimuth and/or elevation. With a little hardware and software, you can implement a system which can automatically track a moving "target" (i.e., a satellite), automatically turn to the correct azimuth for a DX location or a selected repeater, or simply have fun using a joystick to control something as big as an antenna. The discussion below assumes you are using an IBM PC or clone computer. If you have some other type of computer, you will still get some useful ideas, but you will have to design your own hardware interface and software.

First, let's look at how your computer can control one or more rotators, how it "knows" where your antennas are pointing, and finally, how to put the system all together.

Computer Interface

Somehow, we first have to get usable signals out of the computer. Although you could build your own interface unit (if you know enough about the internal workings of a PC), a quicker and easier way would be to buy a kit made for this purpose. JDR Microdevices (2233 Samaritan Dr., San Jose CA 95124) sells several such kits, or you can buy a completely wired and tested board from them. The JDR PCL-720 ($169.95) is a

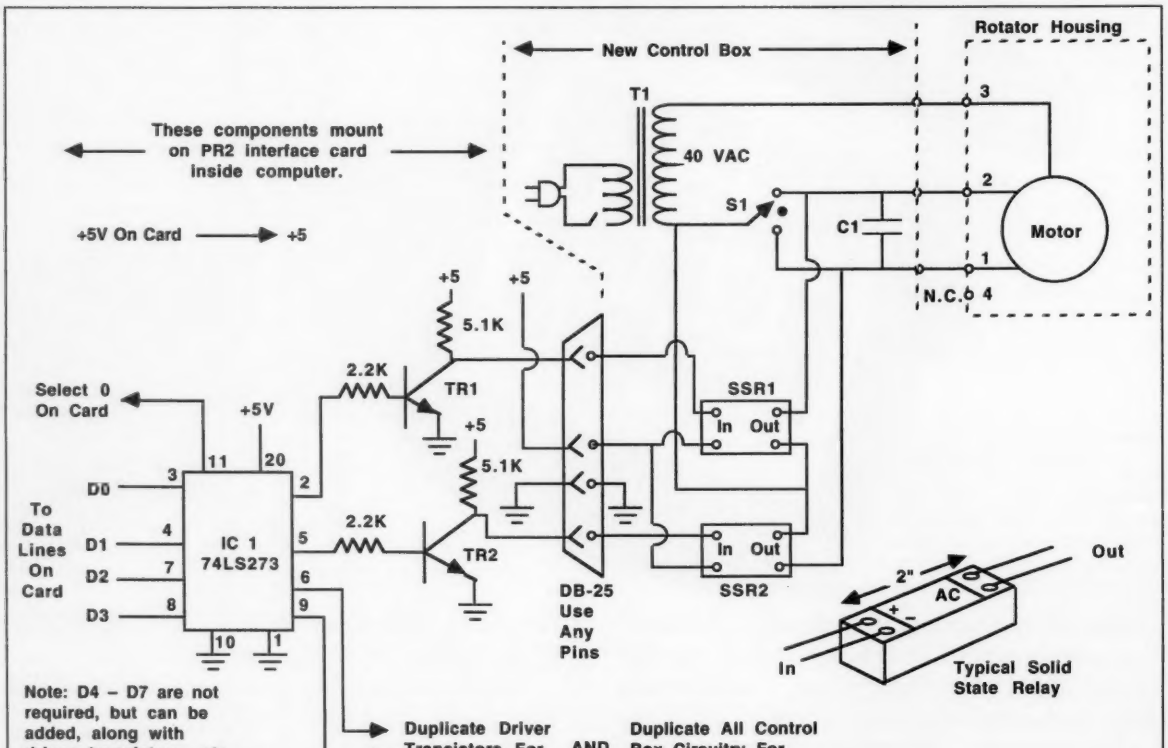

Figure 1. Computer control of rotators.

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CIRCLE 86 ON READER SERVICE CARD

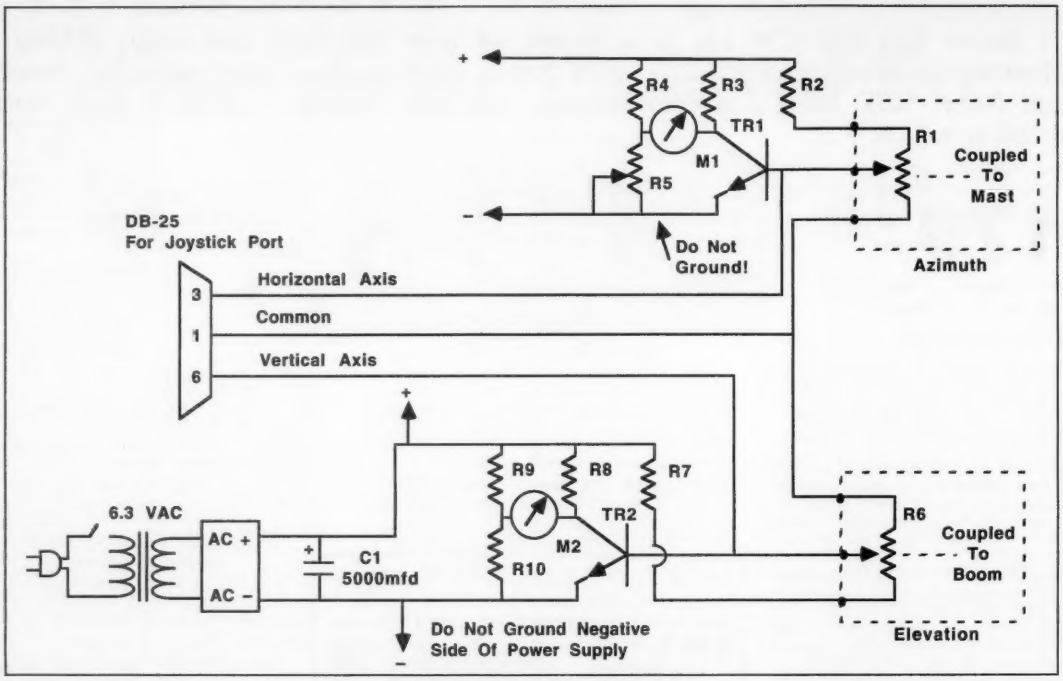

Figure 2. Using joystick port.

fully-assembled I/O card which has more than enough input and output channels for several other projects besides a rotator control. That card also includes three timer/counter channels which you may find useful, and some software drivers written in BASIC. I bought the JDR-PR2 "prototyping" kit ($29.95), and the PR2-PK parts kit ($8.95) instead, and added the additional circuits and parts. Assembling my board took only about an hour, and it worked immediately upon installing it into a spare expansion slot on the motherboard. The instructions with the kit are quite clear, and JDR includes several suggestions for other projects using the board.

What the PR2 kit gives you is "decoding" of a block of input and output addresses; that is, it gives you the ability to send data to, or get data from, external devices by appropriate software commands. The PR2 kit actually gives you the ability to address up to 32 separate data ports, many more than we will need in our controller. It also has plenty of

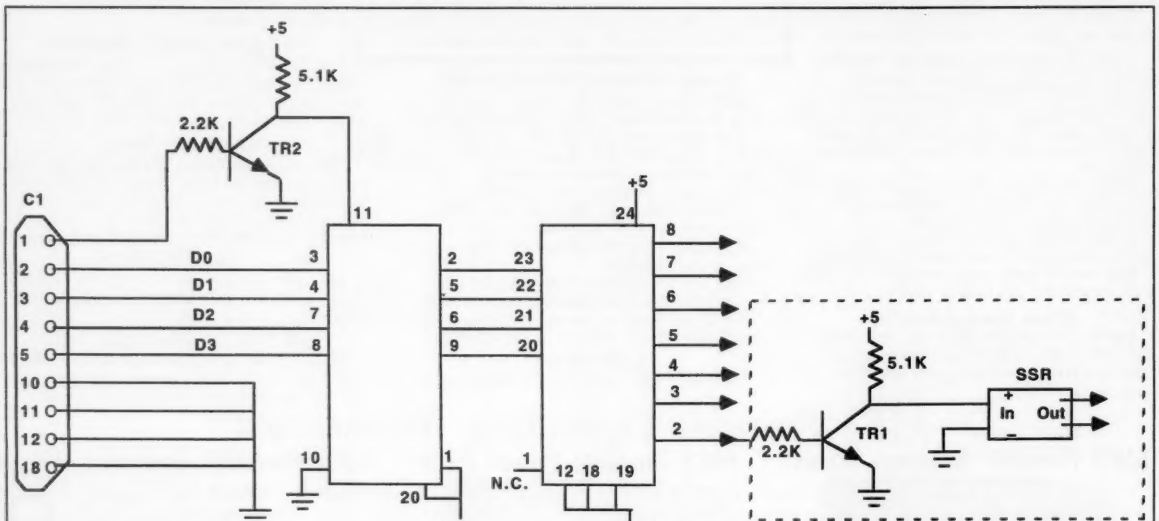

Figure 3. Quick and dirty interface.

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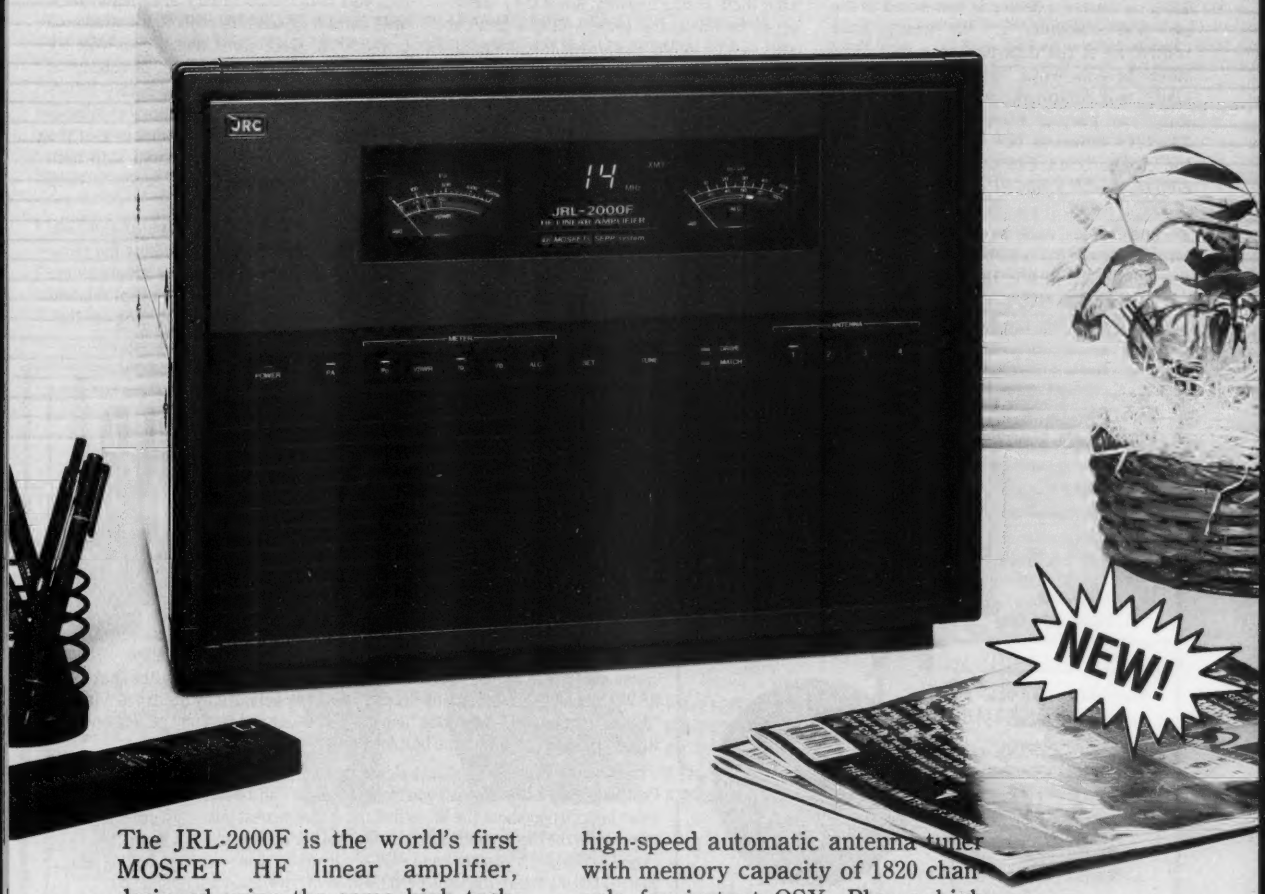

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CIRCLE 159 ON READER SERVICE CARD

room for the handful of ICs and transistors we will need.

A DIP switch which comes with the kit allows you to select the range of addresses for the ports. With switch 1 off (up) and the other three switches on, the address range will be from 768 to 799. As supplied, and without any further decoding, the PR2 actually decodes "blocks" of four addresses each; to make full use of all 32 addresses, you will have to add more decoders. However, for our purposes, we only need one port address. Let's decide to use address 768 for that port.

If you are familiar with the BASIC computer language, you probably recognize the software command "OUT x,n" which sends a number, n, (which must be between 0 and 255), to whatever device is connected to the data port at address "x." We need to have something at the data port to capture and store the data word, then operate a relay which will control the rotator. The "something" we need is an 8-bit data latch, the 74LS273 shown as IC1 in Figure 1. When the computer executes the "OUT 768,n" command, the 8 bits of data (whatever we send for "n") will come out on the data bus while a single "write strobe" pulse appears on the output line which has been decoded for address 768 (that is, the "Select 0" line in the case of the PR2 interface board). The write strobe latches the data into IC1.

For a little extra protection of the computer against accidents (since we are about to connect to the "harsh" external world), the output pins of IC1 are routed first to a set of driver transistors. In turn, the driver transistor outputs are routed to a DB-25 connector, which mounts on a bracket supplied with the PR2 kit. From the connector, a cable connects to our new control box, which contains the "solid-state relays," SSR1 and SSR2. (A "solid-state relay" is an integrated package specially designed for interfacing logic-level signals to high power levels in the real world. They require only about 3 volts on the input to operate, and at current levels easily provided by small transistors. They are much too large to fit on the interface board inside the computer, but we don't want them inside anyway, since they are going to be switching some voltages and currents, which could mean instant death to any other computer chips. (Note that if you want to test these relays, you must have a large AC voltage on the output side or they will not seem to work; you cannot test them with just an ohmmeter.)

We next wire the outputs of the solid-state relays in parallel with the manual switch (S1) described in Part 1 of this article. SSR1 applies our 40 VAC motor power to one side of the phasing capacitor to produce rotation in one direction, while SSR2 can apply power to the other side to rotate in the other direction. When neither relay is on, no power is applied, and the rotator stops. If you wire the circuit exactly as shown in Figure 1, you can control the rotator with just three BASIC commands: OUT 768,1 causes rotation in one direction, OUT 768,2 rotates the other way, and OUT 768,0 stops all rotation. If you want to control a second rotator (i.e., for both azimuth and elevation) you will have to add two more driver transistors connected to IC1, two more wires down to the control box, and duplicate the transformer, phasing capacitor, solid-state relays, etc., in the control box. When wired to the data latch as shown, BASIC commands for the second rotator would be "OUT 768,4" for one direction, and "OUT 768,8" for the other direction, and, again, "OUT 768,0" to stop. (Unless you understand binary arithmetic, be a little careful of sending any other commands to port 768, since some data words will try to make a rotator turn in both directions at once! If you do understand the binary values involved, you can figure out how to control both rotators at once, but remember that the stop command (OUT 768,0) will stop both rotators, even if one of them needs to keep going longer.

Now that we have one or two rotators under computer control, let's see how the computer can determine where the antennas are pointing. Although the more elegant method would be to use a separate "analog-to-digi-

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CIRCLE 147 ON READER SERVICE CARD

A Quick and Dirty Interface

There is a sneaky way to achieve computer control of rotators which eliminates the requirement for building or buying an interface card, and requires almost no external hardware, but it depends on your familiarity with BASIC programming and your willingness to do some experimenting. First of all, you need a second line printer (parallel) port in your computer; it should be set up as printer port "LPT2." If you don't already have one, you can get an interface card for about $20. The parallel printer port can be made to act very much like the output ports we created with the interface board described earlier. However, instead of sending data to an output port ("OUT 768,n", etc.), we are going to "LPRINT" the data to LPT2. External to the computer, we have to build a data latching circuit using a 74LS273 just as before. Then we will use a 74LS154 4-line-to-16-line decoder IC to interpret the data and activate one of 16 output lines to cause rotator action. (One and only one of the 74LS154 output lines will go to the low level for each value of "n" between 0 and 15.) The low level outputs are routed to driver transistors, then to solid-state relays as before. Figure 3 gives the basic concept.

The quick and dirty way to get position readout depends on software only. It turns out that you can get a fairly accurate estimate of the antenna position by simply starting from a known point, then computing how many times you have to go around a software loop to use up enough time to rotate to the new position. That is, for example, if the antenna is known to be on an azimuth of 35 degrees, and you want to turn to 77 degrees, you can develop an algorithm which tells you that it takes "x" seconds to rotate 42 degrees. Then you start the rotation, go around a software loop ("FOR I = 1 TO n: NEXT I") to create a time delay which is "x" seconds long, then stop the rotation. You will have to do some experimenting to find out what kinds of "x" and "n" values you need; these are highly dependent on your computer's speed and how fast your rotator actually turns. Be sure to include code in your program to save the most recent heading(s) for the next use, because the computer doesn't have any idea where the antenna is really pointing! (Engineers call this an "open loop" control system because there is no feedback from the thing being controlled.) You also need to save the last heading(s) to a data file before you turn the system off, and reload the file the next time you turn it on. Remember, also, that with this "quickest and dirtiest" method, you will have to run your antenna control program every time you want to move the antenna or see where it is pointing.

tal" convertor circuit, the easiest way to get into the computer is to connect the potentiometers into a "joystick" (or "game") port. Joysticks are nothing more than a pair of potentiometers, anyway. My system uses a game interface card made by Gravis. This card expects to see a joystick which has potentiometers of about 100k ohms each. The connections for the joystick port are shown in Figure 2. (Since most joysticks built for use with PC clones are interchangeable, the pin connections should be the same for any game card, but you should check by testing a joystick known to work with your computer.) Note that one side of the potentiometers is common, but that the common line is not grounded, and you need to make sure your potentiometers are not grounded somewhere.

Unfortunately, that's not quite all there is to it. Back in Part 1 we used the rotator potentiometer to drive a meter circuit to display position, and this required applying a small voltage to the potentiometer. If you're like me, you want to retain that meter readout capability (along with the direction control switch, S1) so that you don't always have to run the computer. However, with that voltage applied to the potentiometer, we cannot now simply hook the potentiometer directly to the joystick port because the game card expects to see a pure resistance only, not a voltage or current.

Figure 2 shows a way to simultaneously drive a meter and a joystick port from the same potentiometer. One side and the wiper of the potentiometer control the base current in an NPN transistor, which is one leg of a bridge circuit. The meter provides the manual-visual display. The other end of the potentiometer and the wiper are used as the input to the joystick port. Note that the transistor

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0508G	1	170	28	15/0.6	Standard
0508R	1	170	28	–/–	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	–/–	Repeater
0550G	5-10	375	60	15/0.6	HPA
0550RH	5-10	375	60	–/–	Repeater HPA
0552G	25-40	375	55	15/0.6	HPA
0552RH	25-40	375	55	–/–	Repeater HPA
144 MHz					
1403G	1-5	10-50	6	15/0.6	LPA
1406G	25	100	12	15/0.6	Standard
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	–/–	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	–/–	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	–/–	Repeater
1450G	5	350	56	15/0.6	HPA
1450RH	5	350	56	–/–	Repeater HPA
1452G	25	350	50	15/0.6	HPA
1452RH	25	350	50	–/–	Repeater HPA
1454G	50-100	350	40	15/0.6	HPA
1454RH	50-100	350	40	–/–	Repeater HPA
220 MHz					
2203G	1-5	10-40	6	14/0.7	LPA
2210G	10	130	20	14/0.7	Standard
2210R	10	130	19	–/–	Repeater
2212G	30	130	16	14/0.7	Standard
2212R	30	130	15	–/–	Repeater
2250G	5	220	40	14/0.7	HPA
2250RH	5	250	40	–/–	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	250	36	–/–	Repeater HPA
2254G	75	220	32	14/07	HPA
2254RH	75	250	32	–/–	Repeater HPA
440 MHz					
4403G	1-5	7-25	4	12/1.1	LPA
4410G	10	100	19	12/1.1	Standard
4410R	10	100	18	–/–	Repeater
4412G	20-30	100	19	12/1.1	Standard
4412R	20-30	100	18	–/–	Repeater
4448G	5	100	22	12/1.1	HPA
4448R	5	100	22	–/–	Repeater HPA
4450G	5-10	175	34	12/1.1	HPA
4450RE	5-10	175	34	–/–	Repeater HPA
4452G	25	175	29	12/1.1	HPA
4452RE	25	175	29	–/–	Repeater HPA
4454G	75	175	25	12/1.1	HPA
4454RE	75	175	25	–/–	Repeater HPA

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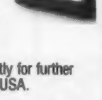
Band	Model	NF (dB)	Gain (dB)	Connector
50 MHz	0520B	.5	25	BNC
50 MHz	0520N	.5	25	N
144 MHz	1420B	.5	24	BNC
144 MHz	1420N	.5	24	N
220 MHz	2220B	.5	22	BNC
220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	GNC
440 MHz	4420N	.5	18	N
1.2 GHz	1020B	.9	14	BNC
1.2 GHz	1020N	.9	14	N



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CIRCLE 232 ON READER SERVICE CARD

Joystick Antenna Control Program Segment

```
100 REM - ROTATE CW
110 WHILE STICK(0)**65
112 OUT 768,1
116 WEND
118 OUT 768,0; REM - STOP ROTATION
120 REM - ROTATE CCW
122 WHILE STICK(0)*35
124 OUT 768,2
126 WEND
128 OUT 768,0: REM - STOP
130 REM - ROTATE UP
132 WHILE STICK(1)**65
134 OUT 768,4
136 WEND
138 OUT 768,0: REM - STOP
140 REM - ROTATE DOWN
142 WHILE STICK(1)*35
144 OUT 768,8
146 WEND
148 OUT 768,0: REM - STOP
150 GOTO 100
```

and meter portion of the circuit use a "floating" power supply—the negative side of the supply must not be grounded or you can accidently ground one side of your joystick, with possible damage to the game card. In this application, you need to use a rotator potentiometer (R1) of about 100k ohms since the game card expects such a value in the normal joystick application. Also, pick a linear-taper potentiometer for R1, again to emulate the joystick.

I have also used one other method to get both a meter display and a joystick port driver. That method involves putting an LED diode in the collector circuit of the transistor, and optically coupling the LED to a cadmium-sulfide photoresistor (Radio Shack 276-1657). The CdS photoresistor has a "dark" resistance of at least 100k ohms, and can go down to less than 100 ohms with just the light from an LED. The CdS photoresistor can then be connected directly to the joystick input lines. With this method, there is no electrical path between the meter circuit and the computer, only a safe optical coupling. I assembled the LED and photoresistor unit by inserting the devices into opposite ends of a 1/2" piece of heat shrink tubing. Even after shrinking, enough light leaked in that I had to cover the whole unit in black electrical tape. (Do not try using a "phototransistor" for this purpose; they just don't seem to work, but the CdS cells work fine.)

If you are going to use either of these methods, be prepared to do some amount of juggling of the values of components in the circuit. The hardest part of all is to find a set of components which will produce a linear scale on the meter (that is, without having half of the antenna movement squeezed into one-fourth of the meter scale, etc.). On the joystick side, true linearity is less important since we have to build a look-up table in the software to translate "joystick" values to azimuth and elevation angles anyway.

And Just for Fun . . .

If you have at least one joystick port still available, and a joystick, it is really easy to control your antenna with it (and fun to steer something as big as an antenna with a joystick!) Let's assume that the horizontal pot on your joystick appears as "STICK(0)" in BASIC, and the vertical pot appears as "STICK(1)," and that the STICK values are 50 when the joystick is centered. Let's further assume that you used output port 768, with OUT 768,1 meaning rotate clockwise, OUT 768,2 meaning rotate counter-clockwise, OUT 768,4 meaning rotate up, and OUT 768,8 meaning down. Then the "joystick" part of your BASIC program could look something like that shown in the list at left. You need to add more code to break out of the infinite loop of the program, and to display the position as the antenna moves.

All Together Now

Software is the "glue" which sticks the system together. Now that you have the ability to start and stop rotator(s), control their direction, and get computer feedback on antenna position, you can do almost anything you want via software. If you can write programs in BASIC, the preceding discussions are probably as much as you need to put together a working program. If not, a sample package is available from the *73* BBS (603-924-9343) or address (ppn 70310,775) on Compuserve. For $5, a blank (formatted) disk, and a suitable (padded) SASE, I will also send you a package which includes programs for building your own look-up tables, automated heading menus, graphical (compass) displays, "quick and dirty" timing algorithms, etc., with lots of textual explanations (address: HC 69 Box 1150, Moncks Corner SC 29461). Most programs will be in BASIC, but some have also been compiled to run under DOS. What I don't have (yet), is a program which tracks satellites from ephemeris data, then feeds the real-time position information to an antenna control program for complete autotrack. I would love to hear from anybody who knows of a good tracker, available in BASIC, which can be merged with a controller program. 73

Parts Availability Notes

JDR Microdevices, 2233 Samaritan Dr, San Jose CA 95124, sells cards for PC clone innterfacing. The general-purpose "Prototyping" I/O used in this article is the "PR2" card ($29.95). It is a "full-size" board, plugging into an empty "8-bit" slot on the motherboard. The PR2 has printed wiring for address decoding, saving a lot of time. Save more time by getting the PR2-PK parts kit. ($8.95) Good instructions come with the kit, along with a complete schematic.

All Electronics Corp. (P.O. Box 567, Van Nuys CA 91408; 800-826-5432) usually carries solid-state relays. If not, try Digi-Key (701 Brooks Ave. South, P.O. Box 677, Thief River Falls MN 56701-0677; 800-344-4539) or Surplus Sales of Nebraska (1502 Jones St., Omaha NE 68102; 402-346-4750).

Radio Shack has almost everything else you will need, except maybe the 74LS273 ICs, but these are carried by most parts houses, including Digi-Key.

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4 Computer Control for Beam Antennas, Part II
5 The W2EKY "Ick-Stick" Antenna
6 Compressing the W3EDP
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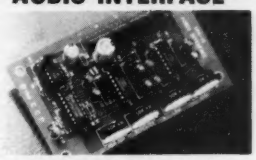

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CIRCLE 118 ON READER SERVICE CARD

The W2EKY "Icky-Stick" Antenna

Hit the roof with an improved ground-plane vertical.

by Ronald B. Koester W2EKY

I lost virtually my whole shack in a fire, and purchasing a replacement rig left me little cash for an antenna or antenna tuner. My first inclination was to put up the proverbial dipole, which usually requires tree climbing (me chicken) or the tools used by Robin Hood. I opted for neither.

My favorite band is 15 meters. This band, combined with the slope of my new shack, made the situation right for a ground-plane antenna. But any connoisseur of antenna theory knows a vertical antenna is only as good as its counterpoise. The traditional ground plane with the usual four drooping radials has a performance only about equal to that of a vertical dipole.

Being an old fan of cubical quads and their broad bandwidth, I decided to use two quad loops in place of four radials to try to improve overall performance, laying the loops on each side of the roof. I used 14-gauge plastic-covered wire, but you can try using whatever happens to be in your junk box.

The wire loop corners can be secured with nails or hooks (see Figure 1). The Icky-Stick is fed with RG 58/U or RG8/U. Using 21.3 MHz as the design center, the height calculates to be:

$$H_{feet} = \frac{246}{\text{Freq. MHz}} = 11 \text{ feet } 6 \text{ inches.}$$

Each loop length is calculated by:

$$L_{feet} = \frac{1005}{\text{Freq. MHz}}$$

= approximately 47 feet.

Construction

The antenna is constructed of two pieces of 3/4-inch (i.d.) aluminum electrical conduit, a 2-foot piece of 1-inch (i.d.) PVC plastic pipe, a 3-foot tripod and #14 wire.

The first section of conduit is cut to a length of 5 feet and is joined with the upper section with a pipe union (usually supplied with conduit). This allows the upper section to be easily removed and pruned (great fun in a high wind) for the lowest SWR. The lower section is drilled to accept 2-10/24 brass machine screws and nuts 1 inch in length (see Figure 2). Secure the loops with soldering lugs and wing nuts.

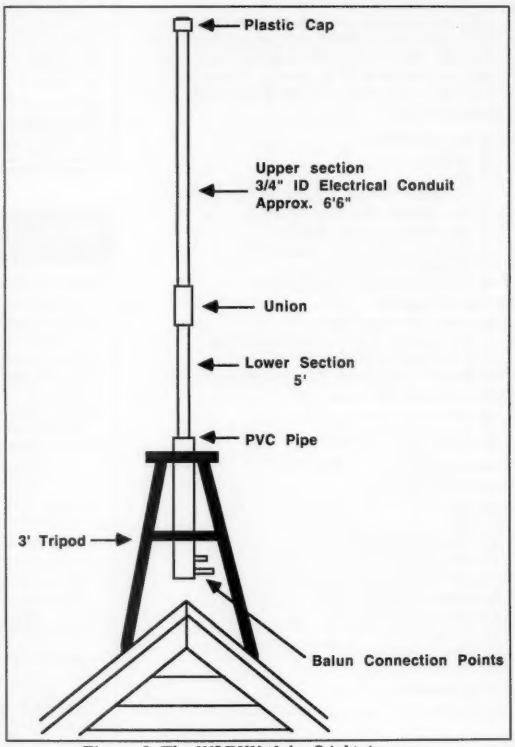

Figure 3. The W2EKY (Icky-Stick) Antenna.

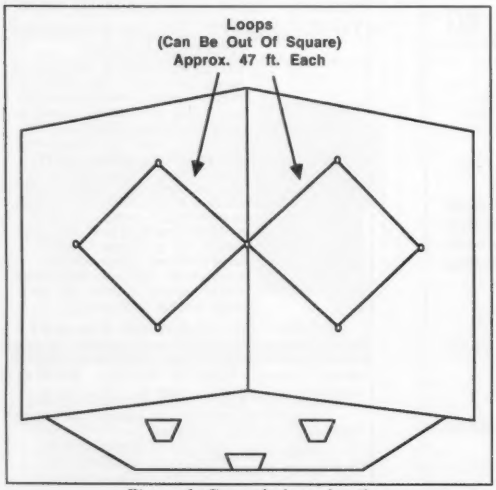

Figure 1. Ground plane detail.

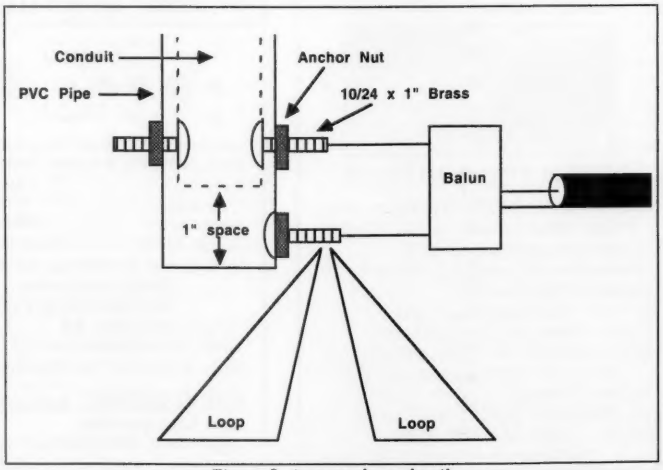

Figure 2. Antenna base detail.

The bottom of the radiator is insulated from the tripod by the 2 feet of PVC pipe. Unfortunately, the PVC pipe does not slip over the conduit unless it is split along its entire length. This is easily accomplished with a radial arm saw or bench saw.

After spraying the first 2 feet of the bottom conduit with WD-40, tap the PVC pipe on. Make sure that a 1-inch space is left between the bottom of the conduit and PVC. This space allows for connecting the balun transformer and loops. I suggest that you use soldering lugs on the wires.

"All the signals I could hear I could work, and with strength equal to or better than that received."

Performance

All the signals I could hear I could work, and with strength equal to or better than that received. It appears that the vertical pattern is at a lower angle due to the loop counterpoises. Interestingly, the Icky-Stick showed a low SWR across the entire band. I also attribute this to the loops. I recommend that the coaxial cable be fed *between the loops*, as I did note some interaction at this QTH. Although the Icky-Stick can be fed directly with coaxial cable, I strongly recommend that a 1:1 balun be used. Without the balun there is a strong chance of TVI and pattern skewing.

As with any vertical, antenna gain would increase if the length of the radiator were increased to 1/2 or 5/8 wavelength. This, of course, would require the use of guy wires (uh-oh).

Happy DX! 73

Parts List

2 ea.	10-foot, 3/4-inch i.d. electrical aluminum conduit/with union
1 ea.	10-foot, 1-inch i.d. plastic PVC pipe (only 2 feet needed)
100 feet	Insulated wire, #14 or what is in the scrap box
1 ea.	3-foot tripod
2 ea.	10/24 brass round head machine screws with nuts, 1 inch long
2 ea.	Brass wing nuts, 10/24
6 ea.	Soldering lugs, #10 hole
1 ea.	Balun transformer 1:1, unbalanced in, balanced out RG 58/U or RG 8/U, as needed

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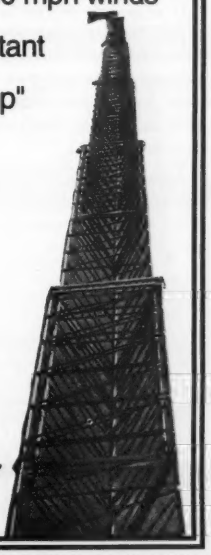

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Compressing the W3EDP

Build this unique multiband restricted space antenna.

by Richard Q. Marris G2BZQ

The W3EDP antenna first appeared around 1936. It was, at that time, an unorthodox multiband antenna design, in as much as it consisted of an 84-foot end-fed wire plus a 17-foot counterpoise, and no ground connection. It was usable on the 80, 40, 20, and 10 meter bands using the same 17-foot counterpoise, except that on 20 meters 6-1/2 feet was suggested. Some people also used it on the 160 meter band. The whole thing was resonated by a coil "L" and variable capacitor "C" (see Figure 1). The coupling coil was connected to the TX output with feedline. Various explanations have been offered over the years as to how the design was arrived at, and how it works, but the truth seems to be that this multiband antenna and counterpoise lengths were originally arrived at by lengthy "cut and try" experiments.

From time to time over the years the W3EDP has "raised its head" in a textbook or magazine and then disappeared again for a few more years. During recent years the W3EDP seems to have proved quite popular among the QRP folk in Europe.

It seemed, to the writer, that if the W3EDP could be really shortened (or compressed) it would make a very useful restricted space antenna for the 80 meter band, and experiments along these lines were carried out, every time keeping the 17 feet counterpoise.

The most obvious idea was to make a helical version about eight feet long, mounted horizontally. With a helical antenna, a "rule of thumb" method is to wind twice the normal length of wire on an insulated rod or tube, and prune down to resonance by removing a few turns at a time. Therefore, 175 feet of wire was wound around a a piece of 1-inch o.d. PVC tubing. Using a 17-foot counterpoise, turns were gradually removed until all the 80 meter band could be tuned using L and C, as in the full-size W3EDP. The contraption worked, but was very narrow bandwidth, and C had to be retuned every few kHz. So a non-helical approach, to compress the antenna, was investigated, with the result being a 30-inch diameter end-fed spiral arrangement (see Figure 2). A further improvement in coupling and bandwidth was made by tapping the coaxial feedline onto L in lieu of the original coupling coil. The antenna was tested mounted both vertically and horizontally. Vertical gave the best results.

"With the final design, it was possible to work throughout Western and Eastern Europe using CW between 3500 and 3600 kHz and about 10 watts CW."

Using about 10 watts CW, with the new antenna standing on a coffee table in the middle of the room, and with the 17-foot counterpoise lying on the floor, it performed very satisfactorily. The construction was modified so that the spiral winding was halfway between the ceiling and floor. About 16 feet of RG58 feedline went to the TX via an existing "T" match ATU, located alongside the TX/RX. This ATU eliminated all TVI, which had been slightly present when the feedline went direct to the TX output.

With the final design, it was possible to work throughout Western and Eastern Europe using CW between 3500 and 3600 kHz and about 10 watts CW. (The antenna will cover the whole of the 3.5 MHz band.)

Once adjusted, the variable capacitor C was "locked" as it was not necessary to retune it. The counterpoise length was changed +/-, but 17 feet gave the best matching and results, as per the original W3EDP. Furthermore, the counterpoise, made of well insulated wire, could be laid either straight, zig-zag, or in "L" or "U" shapes on the floor, with no noticeable change in performance.

Construction

The antenna consists of a 30-inch diameter end-fed spiral winding, wound on an octagonal shape timber mainframe (see Figure 4). The mainframe (see Figure 3) consists of four lengths of timber, each 30" x 5/8" x 1/4". A hole is drilled in the center of each, and glue is applied around the

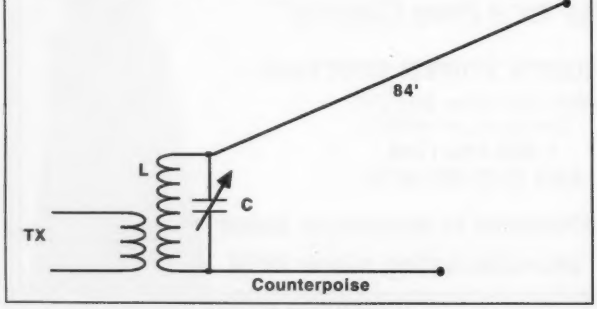

Figure 1. The W3EDP.

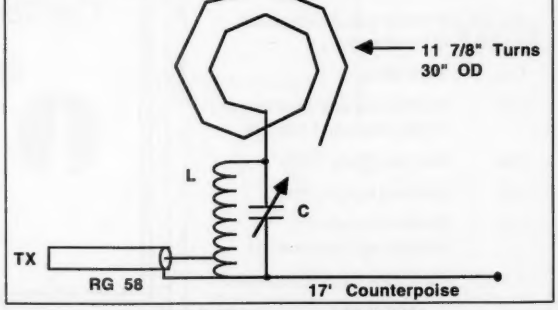

Figure 2. The compressed W3EDP.

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Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic ship antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$ 9.95
Rechargeable internal battery pack, BP-4	$ 8.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	< 25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$189.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$249.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit $34.95
TR-1, RF sensed T-R relay kit $11.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88-108 MHz FM band up to 300' except for hi power FM-4 that goes up to 1/2 mile.
FM-1, basic unit $5.95
FM-2, as above but with added mike preamp $7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
MC-1, miniature sensitive mike cartridge for FM-1,2,4 ..... $2.95

MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
Complete kit MD-3 . $19.95

MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 $12.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly "NO TUNING". Includes FREE disk software, PC Board and Full Documentation.

KIT	P-64A	$59.95
	P-IBM	$59.95
CASE	CPK	$12.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
Each kit $17.95

TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 $6.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit. $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
PB-1 kit $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
SP-1 ..... $29.95 Case-CSP $12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!
TS-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug." Transmitter + receiver set, LB56 . $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
FR-1 kit $19.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
BN-9 kit $6.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

FANTASTIC FM TRANSCEIVERS

•2 METERS
•223 MHz
•440 MHz

SYNTHESIZED—NO CRYSTALS

$149.95

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? . . . . No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-146 kit (2 Meters)	$149.95
FX-223 kit (1¼ Meters)	$149.95
FX-440 kit (3/4 Meters)	$169.95
CFX matching case set	$ 24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $89.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $89.95

QRP TRANSMITTERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

HAM RECEIVERS

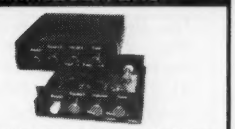
20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in QST and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands $29.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit $24.95
Matching case knob set, CCW $12.95

2, 6, 10 MTR, 220 FM RECEIVERS



Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

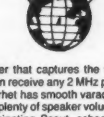
SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit $29.95
Matching case & knob set, CSS $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit $29.95
Matching case set, CFM $12.95

SHORTWAVE RECEIVER



Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $29.95
Shortwave converter kit, SCI $27.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

AIRCRAFT RCVR

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit $24.95
Matching case set, CAR $12.95

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. •Add $3.75 for shipping, handling and insurance. •For foreign orders add 20% for surface mail. •COD (U.S. only), add $5.00. • Orders under $20, add $3.00. •NY residents add 7¾% sales tax. •90-day parts warranty on kit parts. •1-year parts & labor warranty on wired units.

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CIRCLE 34 ON READER SERVICE CARD

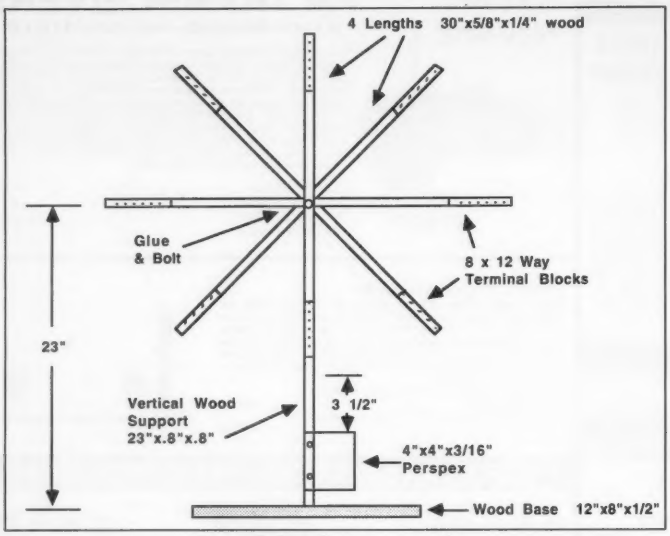

Figure 3. Mainframe construction.

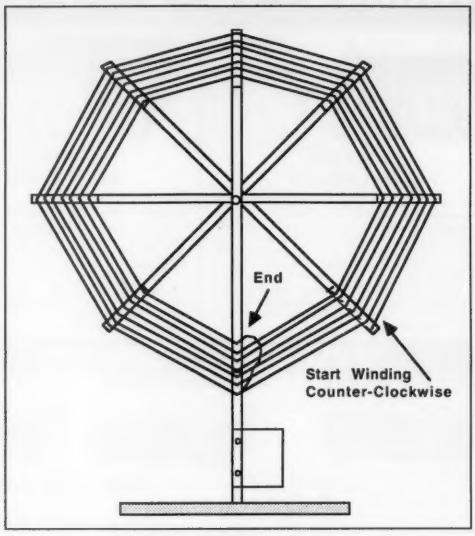

Figure 4. Winding detail.

holes on each timber length. The whole is secured with a bolt, nut and washers. The timber "radial spokes" are arranged in the configuration shown in Figure 3, then the nut and bolt are securely tightened to hold the "spokes" in position while the glue is hardening.

A vertical wood support 23" x 0.8" x 0.8" is screwed and glued to a 12" x 8" x 1/2" timber base, as shown in Figures 3 and 5. The fan of radial spokes is bolted to the top of the vertical support (see Figure 3). The whole mainframe assembly can now be wood-stained.

At the end of each radial spike, *a standard 12-way 2 amp polythene terminal block* is secured with wood screws, and a piece of Perspex sheet measuring 4" x 4" x 3/16" is mounted, as shown, with two wood screws with washers under the heads (see Figures 3 and 5). *[Editor's note: Polythene is the British variation of polyethylene, and Perspex is the British trademark for a hard transparent plastic similar to Plexiglas.]* The 250 pF variable capacitor C is mounted on the Perspex sheet, as shown in Figure 5.

Assuming low power operation, a good quality well-spaced receiver type variable capacitor can be used. Alternatively, a 2-gang 500 + 500 pF variable can be wired in series. Remember that this VC is not at true ground potential, and is therefore mounted on the Perspex plate and fitted with a shaft coupler, insulated shaft, and a 3" diameter instrument knob (see Figure 5).

The B & W Miniductor coil (type 3047) is vertically mounted on a couple of small insulators. On 80 meters the whole of the coil L is connected across the variable capacitor. The coaxial feedline is tapped up from the bottom of the coil for the best coupling point. As a guide: On the prototype, and using RG58 feedline, this tap point was 7-1/2 turns, but it is well worth experimenting with the tap position for best results.

The winding of the spiral antenna, using PVC-covered stranded hook-up wire, is clearly shown in the winding detail (see Figure 4.) The turns are wound counter-clockwise through the holes in the 12-way terminal blocks. At every complete turn the terminal block grub screw should be tightened just enough to hold the wire taut before winding the next turn, and so on.

The counterpoise is the inner polythene-covered conductor removed from a length of RG58, and is clipped on at the junction of C and the bottom of L, as shown in Figures 2 and 5. The coaxial feedline should be secured to the wood base with a couple of cable cleats (see Figure 5).

Operation

Initially, the antenna should be tested with a receiver on the 80 meter band. At 3500 kHz the prototype was resonated with variable capacitor (C) plates about 50% enmeshed, and was found to give a real lively reception performance over the whole band.

Next, the antenna should be fed with a few watts from the TX. An existing "T" type ATU, adjacent to the TX, was an advantage in matching and in eliminating TVI, which was slightly present when the antenna was connected directly to the TX output. Alternative coil taps on L should be tried to achieve the best loading and lowest SWR.

Assuming that the antenna is located in the middle of the room, one resonance setting of C should suffice over 100 kHz+. At this QTH, for use between 3500 and 3600 kHz CW, C was resonated at 3550 kHz and then "locked."

Other Bands

The prototype compressed W3EDP was

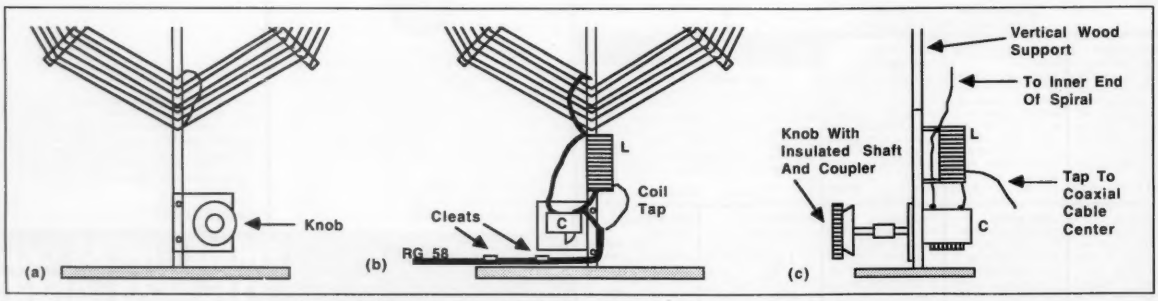

Figure 5. Mounting L and C: A) front view; B) rear view; C) side view.

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ASTRON POWER SUPPLIES

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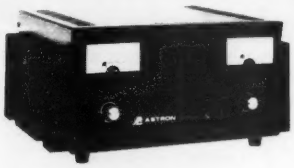


MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

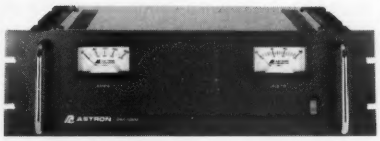
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅛ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES MODEL RM-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

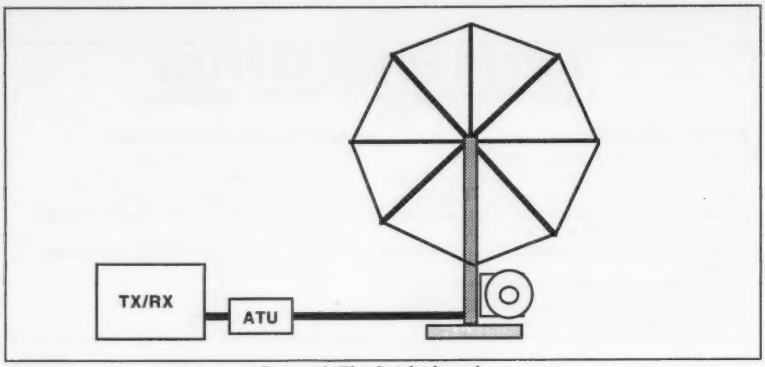


Figure 6. The finished product.

Parts List

C	250 pF variable capacitor (see text)
L	B & W Miniductor type 3047
Wire	PVC stranded hook-up wire (Radio Shack 278-1218 or similar)
Coaxial feedline	RG 58 (16 feet used on prototype)
8	12-way 2 amp polythene terminal blocks
1	Wood base 12" x 8" x 1/2"
1	Vertical wood support 23" x 0.8" x 0.8"
4	Wood spiral supports 30" x 5/8" x 1/4"
Perspex	4" x 4" x 3/16."
3" diameter instrument knob plus 1/4" shaft coupler plus 1/4" insulated shaft (and slow motion drive, if required)	

only required for use on the 80 meter CW band, but there seems to be no reason why it should not be used on 40, 20 and 10 meters (using a 6-1/2-foot-long counterpoise on 20 meters) as in the original W3EDP design. This could be done by tapping the coil L from the top, and moving the coaxial feedline tap. A convenient method would be to make 3-pin plug-in coils. The smaller higher frequency coils could be made of 16- or 14-gauge self-supporting tinned or silver-plated wire. Alternatively, the existing B & W coil could be switched using a ceramic switch. There is much for the experimenter to try.

Alternative Ideas For the Experimenter

A couple of variations are worth mentioning:

1. The height of the spiral antenna winding can be increased by lengthening the vertical support section between the perspex plate and the wood base.

2. No doubt the antenna could be used in a loft, on a flat roof, or other outdoor site, and weatherizing the device would be necessary, and L and C sealed in a suitable box.

Conclusion

The compressed W3EDP prototype proved to be a very effective restricted space antenna. As a monoband 80 meter antenna, during spasmodic operating periods, it has been possible to work all over West, East, North and Southern Europe from a QTH in the south of England. Operating has been restricted to between 0415 and 0530 GMT, when conditions are not at their best. No attempt has been made to work during the nighttime DX hours—the writer has reached an age when he prefers his bed. 73

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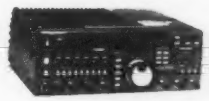

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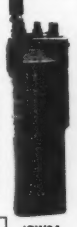

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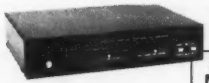

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Distributed Capacity Twisted Loop

An indoor 40 meter antenna for five bucks.

by Jim McLelland WA6QBU

I am one of those unfortunate hams who lives in a neighborhood which does not allow visable outdoor antennas. To make matters worse, the HF bands continue to deteriorate, and I have found it increasingly difficult to communicate after dark without a decent 40 meter antenna. Therefore, I had to find a solution: The Distributed Capacity Twisted Loop. The DCTL was designed for indoor and portable use on the lower high frequency bands. The requirements were: The antenna had to be small, cheap (less than $5), easy to build, constructed of easy-to-find parts, simple to adjust, and work reasonably well.

The following project constructs a flexible loop style antenna that hangs up almost anywhere (I drape it from my bookcase) and can work all over the Western U.S. and Hawaii on 40 after the higher bands have closed up. Moreover, I hear some DX and I can null out (down 30 dB) broadcast stations by rotating the DCTL on a camera tripod. It is quiet to boot! Interested? Read on! Or better yet, spend $5 and an hour of your time and build one yourself.

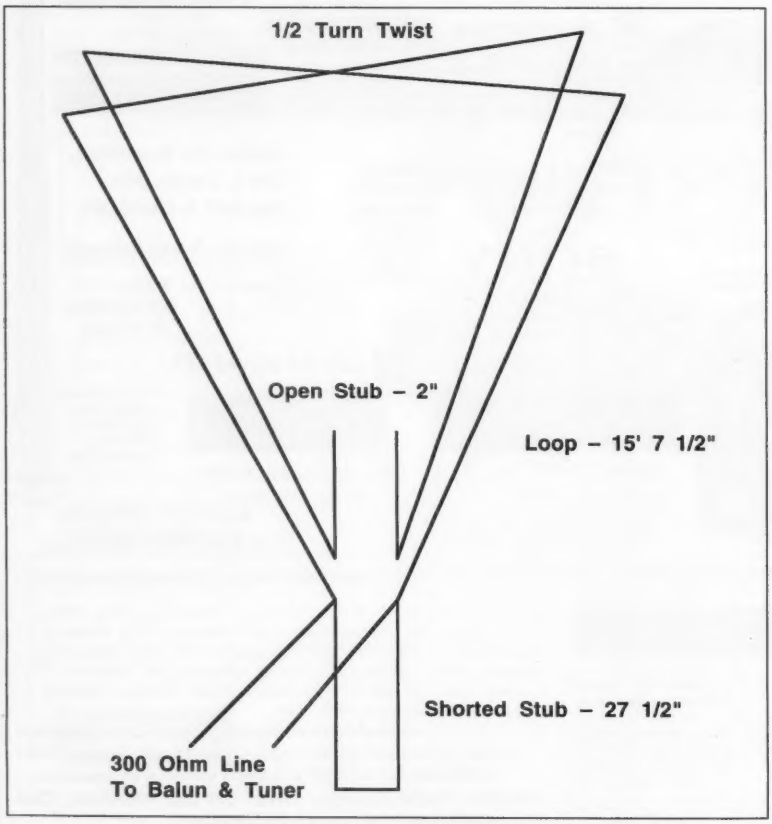

Figure 1. The Distributed Capacity Twisted Loop 1/8 wave antenna stands five feet high.

Description

Referring to the schematic (Figure 1) will probably tell you all you need to know. Since this is an experimental antenna that I am continuing to adapt to different situations and bands (160 meters is in the works), many construction details are left to the builder.

The DCTL is a 15 ' 7" equilateral triangle made from 300 ohm TV lead-in (Radio Shack 15-1153); this is the narrower 5/16" variety. Spacing affects the dimensions so stay with this type of lead-in. The resonant frequency can be lowered by making the open stub longer. With no stub, the antenna resonates at 7.250 MHz, and with a 2" stub, it resonates at 7.050 MHz. I use a 1" stub and a tuner to go anywhere I want on the band. I also use the same low-loss twin-lead into the balun on my tuner—which I strongly recommend because the bandwidth is less than 100 kHz.

The DCTL has an impedance of 5.5 ohms and matching to 300 ohm line is accomplished with a 27-1/2" shorted stub across the feedline at the antenna. This is known as a "hairpin match" and adds some inductance to the antenna and lowers the resonant frequency. With a 50 ohm system (see "Tuning and Experimenting"), the hairpin stub is shorter and therefore the antenna requires a longer open tuning stub (capacitance) to make up for the loss in inductance.

A very important point that must not be overlooked is that the loop has a half-turn twist in it. This means that the feedline is not only connected to opposite ends of the loop but also to opposite sides. To be sure you are doing this right, use an ohmmeter to check for *no continuity* before you hook up the shorted stub and feedline. This lets the insulation act as a high quality capacitor between the antenna legs, which lowers it's resonant frequency. With this system, approximately 1/8 wavelength acts like a half-wavelength system. The open stub just adds a little more capacity to the open opposite ends of the antenna so it can be tuned across the band.

Construction and Installation

To make this antenna work properly, solder all connections and insulate well with

electrical tape and shrink tubing. Measure very carefully, remembering that an extra 2" can put you clear out of the band. Hang as an equilateral triangle with the apex and feedline down, staying away from metal such as housewiring, vents, downspouts, flashing, rain gutters, and windowsills. Lastly, do not use staples to hold the thing in place. As a safety note, *remember that loops have high voltages and high currents. Therefore, don't let anyone (including dogs, cats, kids, or the XYL) touch it.* I've used it with a 100 watt rig with no smoke or sparks yet, but I'd still be very careful.

Tuning and Experimenting

If you only have an antenna tuner, balun and SWR bridge, build the DCTL as described, tune it for 1:1 SWR using low power (I fried my internal balun by not doing this), and look for a QSO. As a side note, an external balun is better than the small internal units most tuners have. Another good alternative is to put RF beads or two of the clip-on RF forms Radio Shack sells on the coax leading to the rig. Any ground wires then go only to the rig, leaving the tuner isolated.

If you want to play a little, here's some more information: I used an MFJ Antenna Bridge for all my initial measurements. A longer open stub lowers the resonant frequency, a longer shorted stub raises the impedance and lowers the frequency, and the shape affects everything somewhat. If you want to use 50 ohm coax directly, use an open stub of 9", a shorted stub of 8-1/2", and clip 1/4" pieces off the open stub until minimum SWR is centered where you want it. You should also coil some coax at the feed point to make a balun (or use one of Radio Shack's cute little forms that I mentioned earlier, winding 10-15 turns of RG-174 on them). Actually, however, I can't tell the difference with or without the balun. Theoretically, the null point on one side of the loop disappears but there is so much pattern distortion inside a house that it really doesn't seem to make any difference. Remember that if you want to use this antenna without a tuner, its bandwidth is only about 100 kHz. If you have a tube rig with a pi-network and a balun, it's no problem, but the new solid-state rigs are another story.

Field Tests

The first station I worked was near Seattle, about 1,000 miles away. Signals were good (7-9) on both ends and the op could hardly believe that my antenna was only 5' high. The next guy was in Salt Lake—same story. Later the same evening I worked a station in Hawaii—he kept saying, "You've got what kind of antenna?" The signals were not very strong but they were quite readable, except for the Pennsylvania station that couldn't hear either of us and kept calling CQ.

As a final note, if you can carefully rotate the antenna, you can really null out broadcast stations. While holding it over my head and rotating it (good thing nobody saw me doing this), I could reduce a 20/9 broadcast station to S7. I think I've got something here, folks. 73

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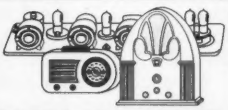

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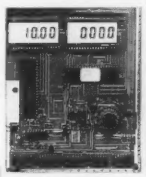

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Evolution of an Antenna

Build a new version of the classic "Lazy H" antenna.

by Sidney Rexford W2TBZ

Not much is new in the design of antennas, and most of the new can be traced to the old. After all, almost 100 years of antenna experimentation has exhausted most of the configurations imaginable. The antenna described in this article is a case in point. Basically, this antenna is a "Lazy H," a vintage workhorse which has an impeccable reputation as a stellar performer.

Let's review the old before going on to the newer version. The classic "Lazy H" is shown in Figure 1. It consisted of four half-wave radiating elements, two side by side over two more also side by side, with all four elements fed in phase. The array's gain will vary as the spacing between the upper and lower elements is varied from a half wavelength to a quarter wavelength, with the greater spacing giving slightly more gain than the lesser spacing. In practice, few hams could get sufficient height while erecting their antennas to make much more than quarter-wave spacing practical, so the evolution of this new version is based on quarter-wavelength spacing. By removing the old feed system and leaving just the radiating portions of the antenna, we find that just the four half-wave elements shown in Figure 2A will do the job.

In electrical circuits (and antennas are no exception), when two points exist with the same polarity and phase relationships, these two points can be connected together. The ends of both the upper and lower pairs of half-wavelength radiating elements fit this condition, so the ends of the lower half-wave elements can be bent up and those of the upper half-wave elements bent down to meet. They are then fastened together. This forms two loops separated by a quarter wave, as shown in Figure 2B.

Our antenna now has become two quad loops in phase and will be treated as such. It is important to realize that the end effects taken into consideration in the original "Lazy H" antenna computations to determine the length of the elements have been altered and the current formula for the overall length of the loops is now 1005 divided by the frequency in MHz. This is the standard formula used in determining the overall dimension of full-wave loops.

Obviously, the feed system used in the original "Lazy H" antenna is no longer practical to feed the new loops. The old phasing lines and the tuned feeder were located high in the air and were difficult to work with. A newer and more modern feed system is necessary. If the loops are opened in the center of the bottom of the loop, and you check the radiation resistance, you will find that it is 100 to 130 ohms, depending on height and ground conductivity under the loops. These points on the loops must be fed in phase and with equal voltages to come up with a working antenna. The most difficult part of the problem is in choosing the manner in which this is done.

A half-wavelength piece of transmission line of any type will act as a 1:1 transformer and reflect the terminating impedance at both ends, so a half-wavelength of transmission line (any transmission line) attached to the loops will appear to have an impedance equal to the impedance of the loop itself. A little experimenting with various types of lines determined that either standard 300 ohm ribbon or 450 ohm ladderline worked best. Coax was tried, but unless a 1:1 balun was used at each loop, radiation from the braid became a problem. The ribbon or ladderline was self-canceling and did not present any distortion of the antenna pattern.

A half-wavelength line from the center of each loop, brought together and fastened in parallel so that the loops are fed in phase, provides an impedance of 50 to 60 ohms, and a 50 ohm coax feed from antenna to hamshack will give an excellent match without a tuner. To prevent radiation from the coax braid, a 1:1 balun should be used. A W2DU balun was used on this antenna. Ferrite core baluns were also used successfully. The use of air core baluns proved disappointing and they are not recommended. Construction details are shown in Figure 3, and dimensions for the loops and the phasing lines are shown in Table 1. As long as the termination (ends) of the ladderline or ribbon phasing lines are mechanically constructed so that flexing is distributed over at least a foot, the lines can be left to swing in the breeze.

This is a single-band antenna, and it is bidirectional. For the 40, 17, 20 and 15 meter bands rotation to provide full directional coverage would be a real challenge, but for 10 and 12 meters, a rotatable framework is feasible.

While the theoretical gain of this array is about 3 dB over a dipole, on-the-air results are better. The antenna is a lower angle radiator than the dipole at the same maximum height and, in the tradition of the "Lazy H," it does a fine job in DX contacts. Radiation patterns for the "Lazy H" can be found in just about any antenna handbook, but for those who do not have one handy, I have included a computer readout prepared by WA4HTR (now a Silent Key) and W4TDI, using the W7EL ELNEC program (Figures 4A and 4B).

Good luck to anyone who builds one of these antennas. I will be glad to answer any questions you may have, just include an SASE (RFD 1, Box 583, Colton NY 13625). And, if you have the space to build one for 40 or 80 meters, I would appreciate a report on the results. Fortune has never smiled on me—I have never had sufficient height to construct one of these. 73

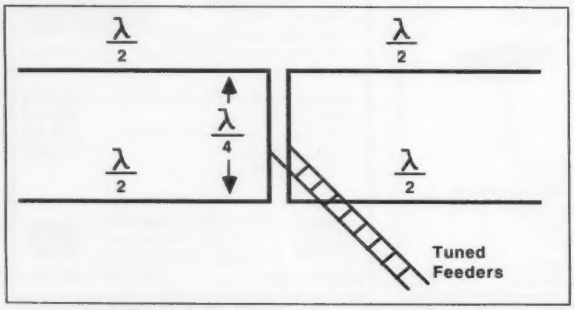

Figure 1. The classic "Lazy H" antenna.

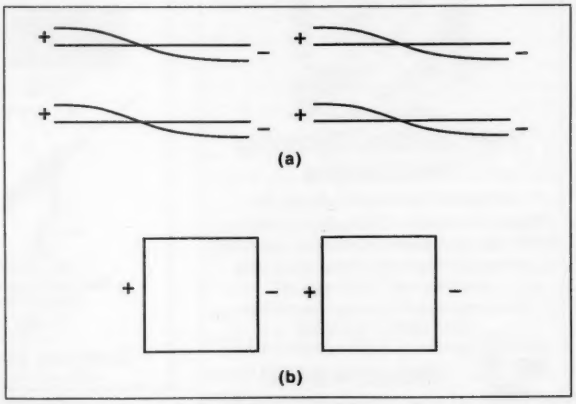

Figure 2. Evolution to two full-wave loops.

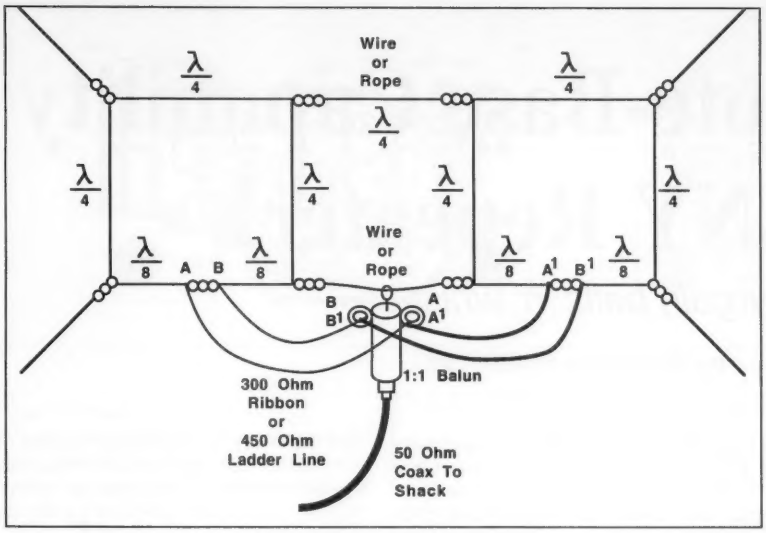

Figure 3. Construction of phased loops.

	λ/4	λ/8	300Ω Ribbon	450Ω Ladderline
40m	34.9 ft.	17.5 ft.	53.3 ft.	62.2 ft.
20m	17.6 ft.	8.8 ft.	27.0 ft.	31.2 ft.
17m	13.9 ft.	6.9 ft.	21.2 ft.	25.2 ft
15m	11.8 ft.	5.9 ft.	18.1 ft.	21.97 ft.
10m	8.67 ft.	4.33 ft.	13.2 ft.	15.33 ft.

Table 1. Dimensions for the sections of the loops and phasing lines.

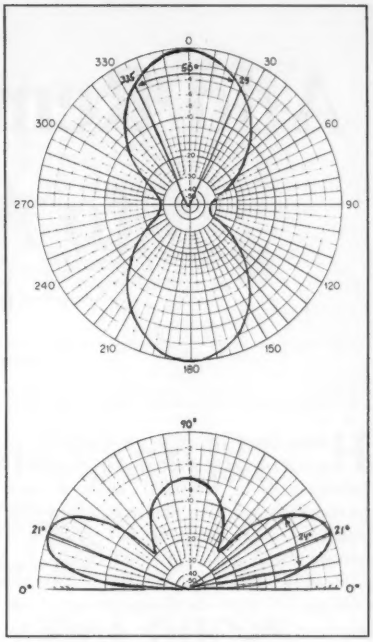

Figure 4. Radiation patterns. Max gain: 11.095 dBi @ 18.1 MHz (typical). Impedance (per loop): 133.404 + j0.040 (using W7EL ELNEC). Bandwidth: 50° -3dB, 65° to 115°.

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CIRCLE 384 ON READER SERVICE CARD

Add Remote-Base Capability to ANY Repeater!

Bargain bells 'n' whistles.

by Klaus Spies WB9YBM

Home-brewed and low-budget repeaters share a common problem: lack of bells 'n' whistles. Here's an easy project that will give you remote-base capability while keeping your repeater home-brewed, and/or low-budget.

Having worked some "rooftop DX" with my HT at the local repeater site, I felt working DX on 10m FM would be enhanced if it could be worked from such a good site. That lead to the development of the schematic shown in Figure 1.

When the squelch signal of the repeater receiver goes positive, both the repeater transmitter's PTT and the remote base transmitter's PTT are enabled through U1A and U2A. Then U3A, through two electronic switches (U4A & B), disables both the squelch signal and audio of the remote base receiver to avoid feedback.

When the squelch signal of the remote base receiver goes positive, the PTT of the remote base transmitter is disabled through U2A and U3B, while enabling the repeater's transmitter through U1A.

Since the FCC requires that you listen to a frequency before transmitting, separate on and off functions are available for both the transmit and receiver sections of the remote base. These on/off functions can be tied directly into whatever DTMF decoder is currently available on the repeater.

Squelch signals should already be present in the repeater. For this circuit (depending on the type transceiver used as remote base), signal conditioning may be required (see Reference 1). This can be done with a single IC. If a margin of safety is desired in the transmitter, a very simple time-out timer can also be added (see Reference 2), as can a "hang" timer

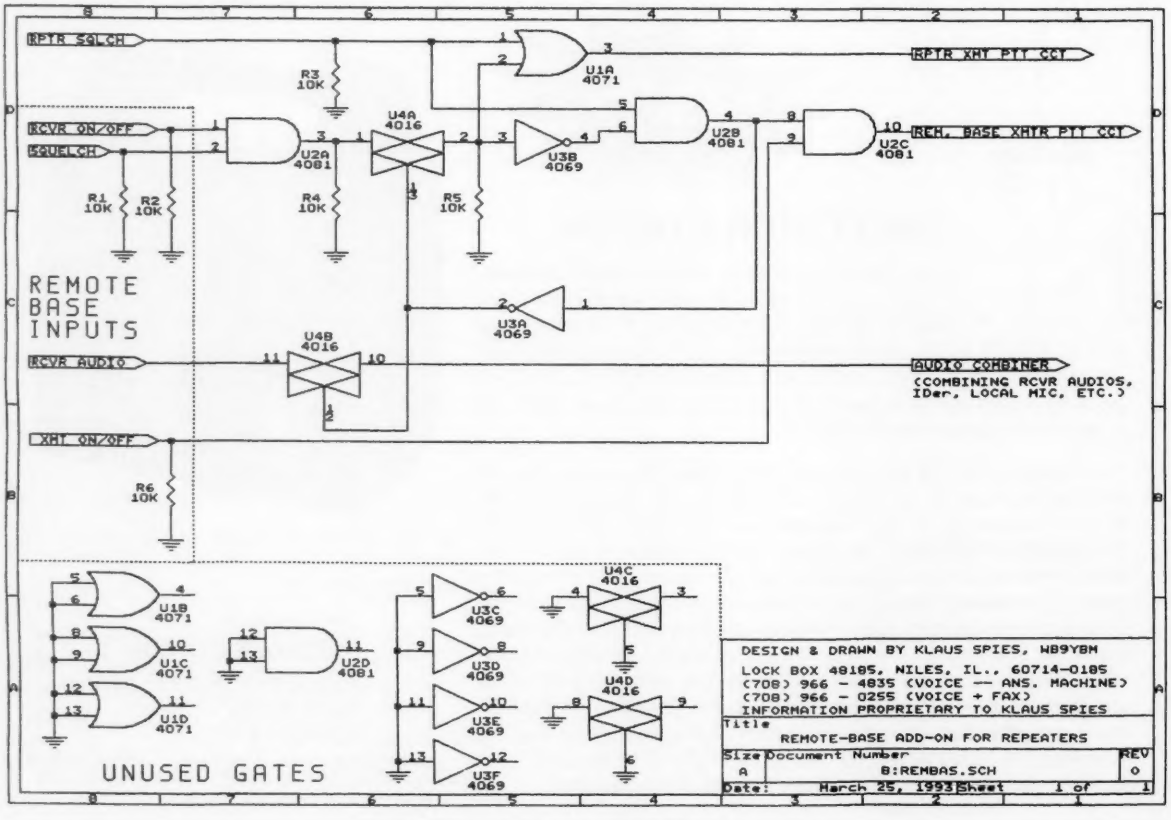

Figure 1. Schematic for remote-base add-on for repeaters.

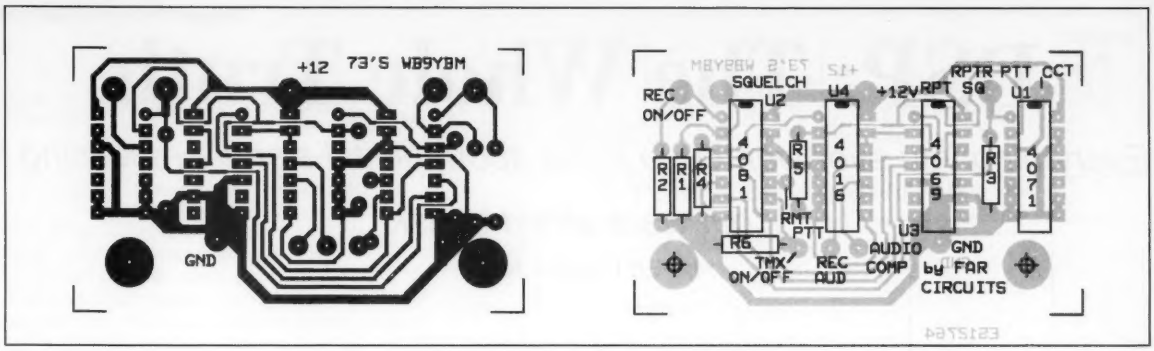

Figure 2. PC board pattern and parts placement diagram.

(see Reference 3).

Since a repeater and a remote base deal with high RF energy, circuit construction should have appropriate safeguards: bypassing on all input/output leads, as a minimum. If installed in the repeater cabinet inside a shielded control section, no other shielding should be necessary. If this isn't the case, install the circuit in a metal box connected to power supply ground. 73

References:

1. "Midland 13-509 Modifications," *73 Amateur Radio*, pg. 27, December 1988.

2. PTT Time-Out, "Circuits," *73 Amateur Radio*, pg. 82, August 1990.

3. Ending Transmitter Chatter, "Circuits," *73 Amateur Radio Today*, pg. 27, February 1991.

Supply Connections

	+12V	Ground
4071	Pin 14	Pin 7
4081	Pin 14	Pin 7
4069	Pin 14	Pin 7
4016	Pin 14	Pin 7

Notes:

1. Pull-down resistors on control inputs ensure default modes are off, to avoid interference from the remote base.

2. All ICs are 14-pin packages.

Parts List

Item	Quantity	Reference	Part
1	6	R1, R2, R3, R4,R5, R6	10k
2	1	U1	4071
3	1	U2	4081
4	1	U3	4069
5	1	U4	4016

Parts are available from Digi-Key Electronics, Thief River Falls MN.

Drilled and etched PC boards are available from FAR Circuits, 18N640 Field Ct., Dundee IL 60118, for $4 plus $1.50 S & H.

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CIRCLE 29 ON READER SERVICE CARD

DSP: The Whole Truth

*Everything you ever wanted to know about digital signal processing.**

**but were afraid to ask.*

by Ed Doubek N9RF

Designing Digital Processing into several police communication systems over the last few years produced some definite improvements in the quality of these systems. Applying the DSP principles to the reissuing of old recordings when they were released as compact discs has also helped to provide the quality the CD is noted for. This article will give you some insight into what the DSP systems can and cannot do, and will also suggest some low-cost modifications which can help to improve the quality of DSP-enhanced reception when used in amateur radio.

Digital Signal Processing seems to have taken the amateur radio community by storm. Many amateurs are not only asking how it works but how *well* it works. Manufacturers are rushing to provide this feature in new equipment so they can take advantage of this new-found miracle cure.

This article will give you a better insight into the working of a typical DSP system and will also provide a list of questions to ask yourself or a vendor when you are getting ready to part with your hard-earned cash for a new station accessory.

Design of DSP Units

Figure 1 shows the hardware configuration of a typical Digital Signal Processing device. The hardware consists of an analog-to-digital converter that takes analog audio output of the receiver and converts it to a digital representation of the audio. The audio is processed in digital form and then converted back to an analog form with a digital-to-analog converter. It can then be amplified by a conventional audio amplifier and passed along to a speaker. After this processing, the final audio that is heard from the speaker can either be nearly identical to the original audio or it can be modified (corrected/improved) in the processing operation by removing unwanted distortion or noise from the audio signal. For narrowband (communication) audio, a microprocessor operating at 30 to 40 MHz is typically used to enable several computations to be performed on each audio sample. The typical sampling rate is at least two times the highest audio frequency to be processed. The NYQUIST rate is normally used since at this sampling rate the processor speed can be minimized and the distortion is minimal. The NYQUIST rate of sampling for a 3 kHz maximum transmitted audio frequency turns out to be 6 kHz.

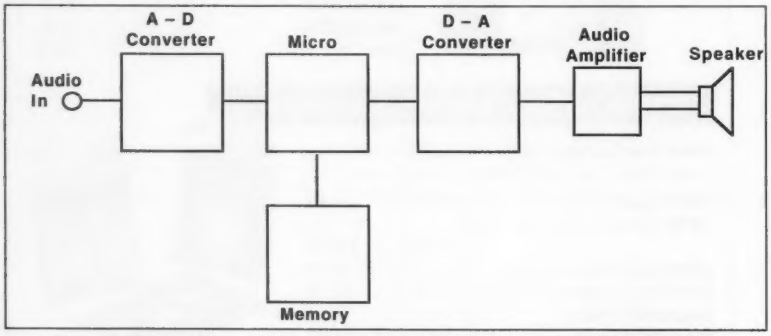

Figure 1. The hardware configuration of a typical Digital Signal Processing device.

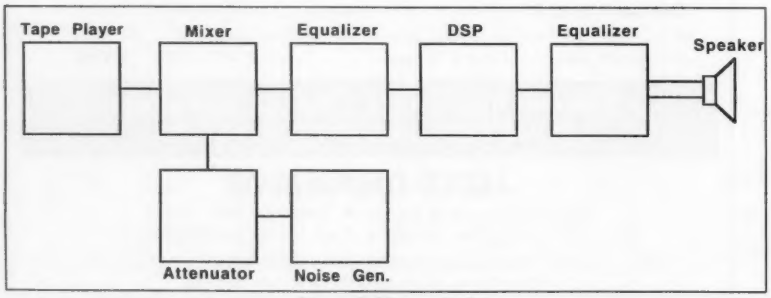

Figure 2. Test method.

In addition to the hardware, software is required to define the modification to be performed on the audio sample. The software is in fact the most variable part of the DSP system and causes the biggest variation in the DSP performance of the system. Normally one of two methods is used to program the processing. In the first case, an algorithm (formula) is used to process the signal and to generate the correction required to improve the audio. The second method is to look up the sampled audio in a table, then correct the audio based on what the table shows. In some cases, a combination of the two methods is used to correct the audio. Keep in mind that the more sophisticated the technique used, the more instructions per sample are required, and consequently the more expensive the software and the higher-speed hardware required to do the processing.

Features

Some DSP units are only suitable for eliminating heterodynes. Other units simply provide bandpass characteristics. The best systems employ an additional feature which provides a noise reduction mode as well as getting rid of white noise and pink noise. When purchasing a DSP unit, make sure the front panel gives you several modes of operation as well. If the mode switch provided is limited to just CW or SSB, it is probable the unit has either no noise reduction feature or one not adequately implemented.

Test Setup

Figure 2 shows the test arrangement that was used to determine what a DSP system can do to improve the quality of the audio and the intelligibility. This same test setup was also incorporated in a system to demonstrate the audio DSP technique to police departments. A cassette tape of good quality was mixed with a variable noise source to gradually reduce the intelligibility of the recording, then a comparison was made by switching in a JPS (NIR-10) DSP

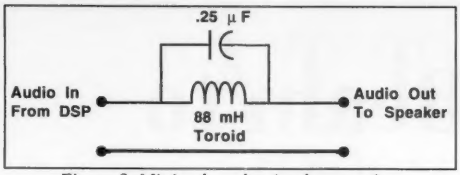

Figure 3. Minimal analog implementation.

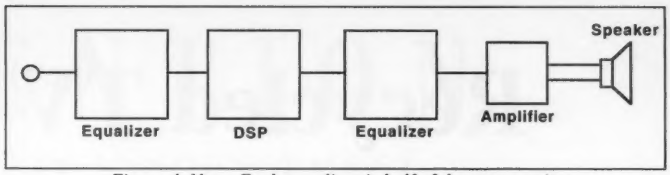

Figure 4. Note: Each equalizer is half of the stereo unit.

unit. When compared with the bandpass mode, the NIR (noise interference reduction) mode provides some rather dramatic results on voice signals. Improvements of between 6 to 10 dB have resulted, depending on the particular voice characteristic being processed. In most cases, a complete removal of all heterodynes is accomplished. The results in the noise reduction mode are not quite as good on CW because slow-speed CW looks like interference and gets completely removed. Above about 10 wpm CW can be processed with reasonable results. However, the bandpass filtering modes greatly improve the CW mode because of the nonexistent ringing. Normal CW filters in a receiver usually introduce ringing and other distortion when set to narrow passband.

DSP's most dramatic feature is its ability to completely eliminate (to the tune of 40 or more dB) any combination of constant or slowly-keyed heterodynes. In many units, a signal lasting for three ms or so in the NF mode is considered by the software to be a heterodyne and is removed. When in the NIR mode, a suddenly-appearing tone is removed after approximately 300 ms.

Can DSP Be Improved?

Yes, DSP can be improved. One of the problems that DSP exhibits is that as the amount of DSP action is increased, the amount of harmonic distortion of the lower frequencies being processed increases as well, resulting in a loss of intelligibility. When copying a heavily-accented voice signal, the DSP signal is even harder to understand. It has been shown that this distortion can be significantly removed by a change in the algorithm used by the processor, or by using an analog filter, as shown in Figure 3. Using a very sophisticated algorithm may require a faster microprocessor.

Another problem with DSP results from highly processed audio in the transmitter. Many non-DSP transmitter audio processors result in an increase in the harmonic distortion of the audio in the area of 1 kHz. This causes a loss of intelligibility at the receiver, especially when heavy DSP is applied to the received audio. In the case of heavily clipped FM audio resulting from some types of deviation control, the received audio may be almost impossible to understand when combined with an excited operator, a time of audio stress caused by an emergency, or when working a new country.

The Best Answer

In Figure 4, a dual-section seven-, 10- or 15-band equalizer can be used to remove the audio response in the area of 800 to 1700 Hz. When one section of this filter is used to limit this band of frequencies ahead of the DSP unit and a second bandpass filter is used after the DSP unit, the improvement is dramatic and can almost double the effectiveness of the DSP system. When using this dual-band equalization, much of the distortion generated in the transmitter audio processor and received noise never enters the DSP unit and is never processed.

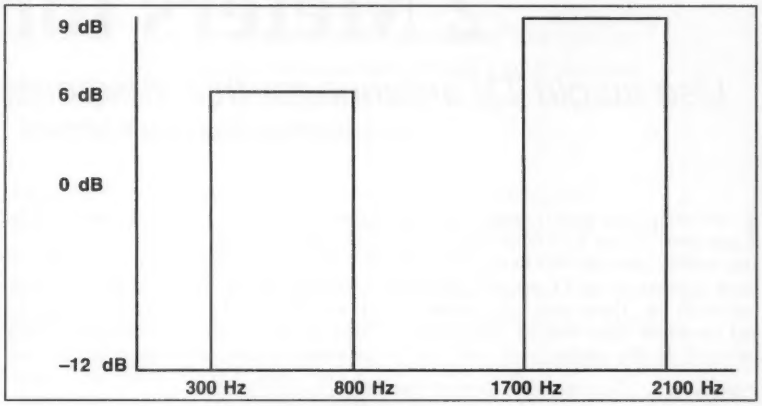

Figure 5. Equalizer curve.

The second section of the equalizer is placed after the DSP unit and helps to improve the intelligibility of the processed audio. With this equalization, it has been shown that the audio can be intelligible with an increase of 3 to 6 dB of interference. A second benefit of this combination improves the intelligibility, even when using little DSP but while copying heavily compressed signals. For most receivers, cutting the spectrum below 300 Hz by at least 12 dB and the spectrum above 2.1 kHz by the same 12 dB removes all non-intelligence-bearing spectrum. The frequency range from 300 to 800 Hz should be boosted by 6 dB above the reference level of 0 dB and the spectrum above 1700 Hz boosted by at least 9 dB.

Even though the audio processing improvements discovered by NASA use different response frequencies than those used in these experiments, the results are similar because of the overall receiver passband dissimilarities.

DSP in the Transmitter

Experimentation using DSP on transmitting has shown little improvement in experiments when the standard bandpass characteristic is used in the DSP units. When the dual-band audio processing curve is used at both ends of the path, DSP does come into its own. An additional 3 to 6 dB of improvement results from this dual DSP implementation by packing the intelligence into two narrow bands rather than one wide band and further improves the intelligibility. This system is like using a 1.6 kHz filter in an SSB receiver without encountering the distortion the narrow filter generates.

DSP at IF Frequencies

If extremely high-speed microprocessors were available, DSP could be feasible in an amateur receiver IF. Because of availability and cost, this type of hardware would be impractical for amateur radio with today's state-of-the-art capabilities. Some pseudo DSP HF units have been implemented with prototype hardware, but they are not practical at this time. With DSP at IF frequencies, this filtering could theoretically place the receiver filtering much closer to the antenna, where it belongs.

Summary

Even without the DSP unit, the equalization curve shown in Figure 5 can be used after a receiver. These seven-band equalizer units are available for $60 new, or can be obtained at many hamfests for $15 to $20. The more versatile 10- or 15-band equalizers make the implementation of this audio curve more accurate. Whether or not you are using DSP, the addition of audio correction to the audio output of your receiver can improve weak signal work, especially on 160 and 80 meters and VHF and UHF DX-ing.

Don't throw away your antenna just yet . . . DSP is good, but it has to have some signal to work on. 73

Recycled TV Beam to 2 Meters for $2

Use an old TV antenna for this inexpensive, two-hour project.

by Marty Gammel KAØNAN

Last spring I was asked to supply a 2 meter beam for our local radio club's Field Day satellite contacts. Not having an extra beam, I found an old TV antenna someone had given me. There were many elements and the square boom was 92" long, perfect for the 11 dB gain needed.

Construction

First, I had to clean the boom of all elements and hardware. To do this, I used an electric drill to remove the rivets. Then I used a Scotch-Brite pad to clean any rust or corrosion from the now empty boom and the removed aluminum elements.

I looked in a few antenna books for dimensions, settling on closely-spaced dimensions based on the NBS standard yagi design. There are many good books for finding workable spacing and element lengths. Using the *ARRL Antenna Handbook*, I developed the dimensions in Table 1 after reworking the spacing guidelines to come up with a seven-element beam that could be used in either vertical or horizontal polarization.

These measurements and spacing should give, in theory, over 11 dB gain, with a front-to-back ratio of 20-25 dB and good side rejection. Bandwidth for 1.5 SWR edges goes from 144.5 MHz to 147.750 MHz with 1.01 SWR at 146.250 to 146.5 MHz. If the beam is to be dedicated to SSB operation only, increase element lengths by 3/16" per MHz to shift the center frequency of operation down toward the bottom of the band.

There should be enough material to make all the elements from the material that you strip off the boom. With all the material I had left, all I had to do was start measuring, marking and cutting. Take great care to drill all the holes squarely. The elements may be mounted either all *on* the boom or all *through* the boom. Mounting the elements through the boom will make a stronger, long-lasting beam, with less chance of elements working loose in the wind. I used stainless steel screws for mounting all of the elements.

Matching

You will need to make a matching network for this yagi. I chose a gamma match made from a piece of 3/8" aluminum tubing 7" long with a piece of RG-8 coax 7.75" long. I used the regular RG-8 coax; if you use RG-8 poly-foam coax you may need to change the length of coax for the gamma match.

To duplicate my gamma match, find a rubber or plastic cap that fits tightly over the end of the gamma tube (see Photo C). Strip the outer jacket and shield from the RG-8

Table 1.

Reflector length 40"	
Driven element length 38.125"	Spacing to driven element 15.75"
1st director length 36.875"	Spacing to 1st director 11"
2nd director length 36.75"	Spacing to 2nd director 15.25"
3rd director length 36.25"	Spacing to 3rd director 15.25"
4th director length 35.875"	Spacing to 4th director 15.25"
5th director length 35.675"	Spacing to 5th director 15.25"

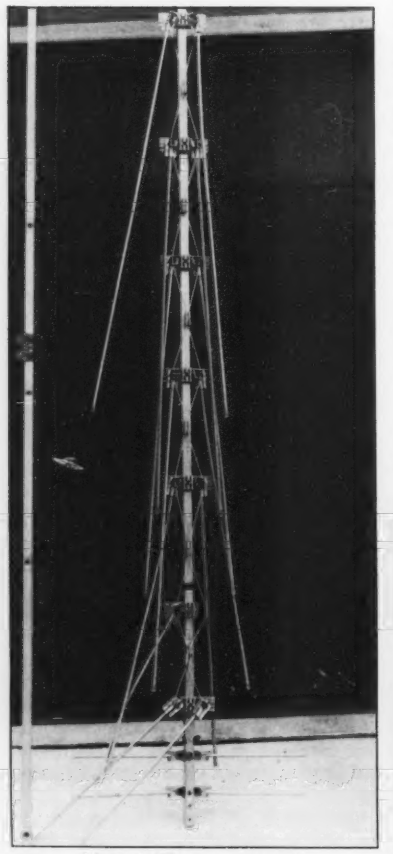

Photo A. The raw materials.

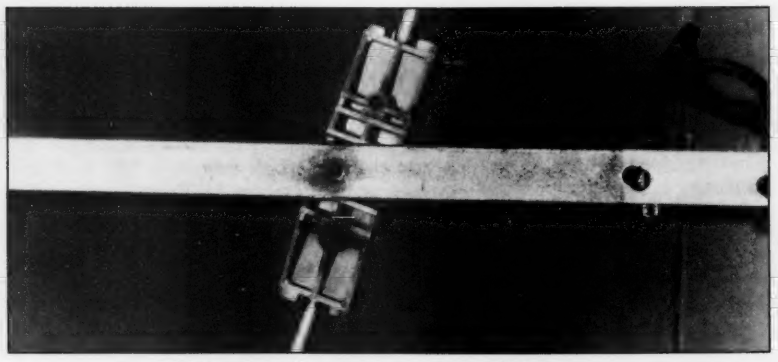

Photo B. Drilling out rivets to clean off the boom.

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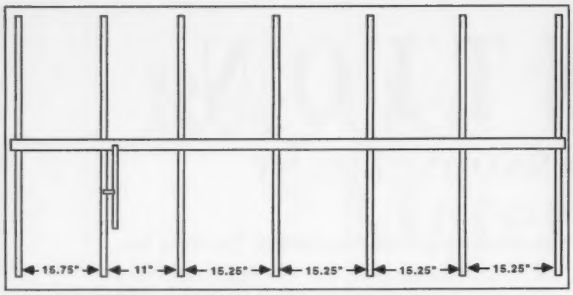

Figure 1. KAØNAN's 7-element 2 meter beam.

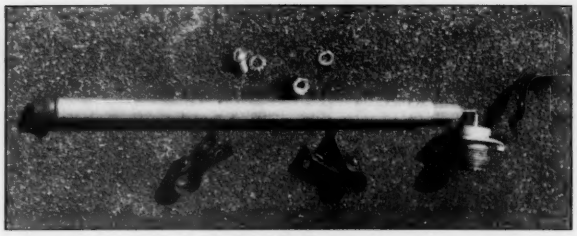

Photo C. Gamma parts.

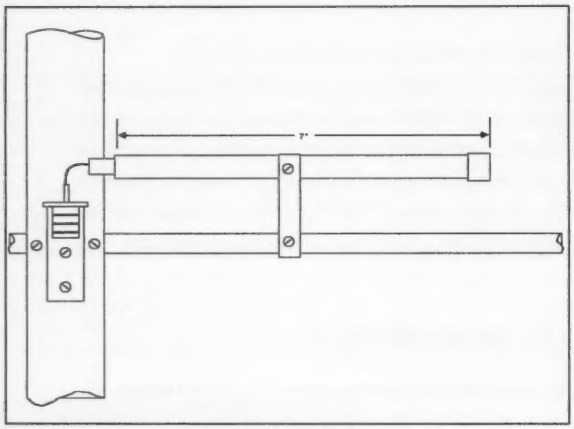

Figure 2. Gamma detail.

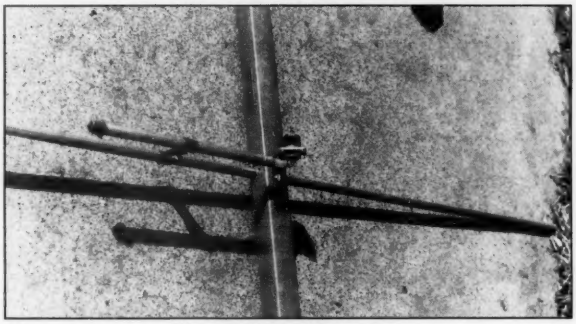

Photo D. View of the gamma.

section of coax. Mount the center conductor and dielectric with a 1/2"-wide strip of aluminum or copper formed around the middle of the 3/8" tubing (see Photos C and D). Then mount an SO-239 panel mount connector to the boom with a piece of aluminum or copper perforated strapping. I was lucky enough to have some copper pipe hanger straps in my junk box to use for this.

Matching a gamma is fairly easy once you have the beam assembled. Mount the completed antenna on the mast about 7 to 8 feet above the ground. Set your radio to the center frequency that you designed for, place an SWR bridge between the radio and the antenna, then apply low power for your test transmission. Carefully note the SWR reading and slide the gamma in or out of the gamma tube until you find the best match. Tighten the gamma to the driven element and you will be ready to install the antenna permanently.

Builder's Notes

A 1/4" drill bit should work well for drilling out the rivets holding the old elements to the boom. If you can get more than one old TV antenna to use as an element source, grab it—you can always use the extra materials for your next antenna project. When drilling the holes for elements, be sure that the elements fit snugly to help maintain squareness with the boom. You can cut the elements to length with a hacksaw, but file the rough-cut end smooth to ease the assembly of the beam. For the mounting screw holes I used a 1/16" drill bit; the screws should fit snugly.

Take your time when drilling and installing the elements to make sure that they are all centered and square to the boom. Elements mounted out of alignment will distort the pattern and reduce the gain of the antenna.

Decide if you are going to mount the beam vertically or horizontally before drilling the element holes so that you can have the holes for clamping the boom to your mast in the proper plane. When the beam is to be vertical, you need to use a non-conducting mast to avoid detuning the beam and skewing the pattern.

I hope you enjoy using this beam and make many contacts with it. This project should take only a couple of hours from start to finish, once you have all the materials on hand.

Many thanks to John Berglund KØUBA for his help in editing this article.

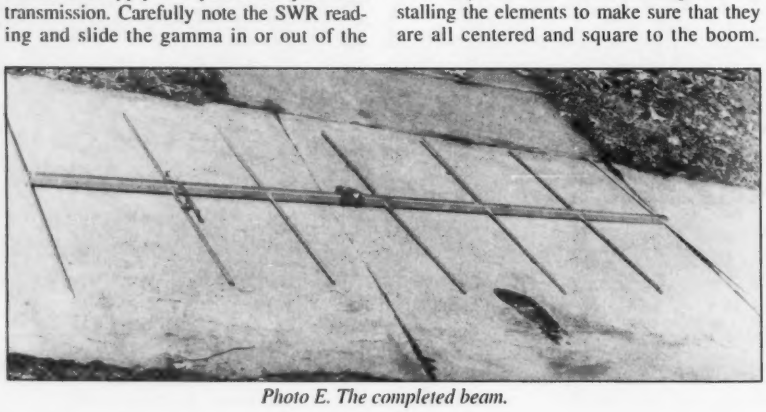

Photo E. The completed beam.

Parts List

- Old TV antennas
- Electric drill or drill press
- 1/4" drill bit
- 1/16" drill bit
- Tape measure
- SO-239 panel mount fitting
- 1/2"-wide metal for gamma hanger
- Stainless steel screws (3/4" #4 self-tapping)
- RG-8 coax (short piece)
- Soldering iron
- Screwdriver
- Hacksaw
- Metal file
- Scotch-Brite pad
- 7" piece of 3/8" aluminum tubing
- Rubber or plastic cap for the gamma
- Marking pen or scribe (to mark measurements on metal)

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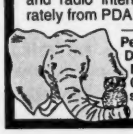

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CIRCLE 6 ON READER SERVICE CARD

A Discone Just For Fun

Fun to design, build and use.

by L. Scott Hall KAØDAQ

"What's wrong? Couldn't you make the last antenna work?" My wife always says this when I'm working on a new antenna. Putting up and taking down antennas is what I do in amateur radio. Anyway, that was a year ago last fall. It was a discone.

Does a discone sound high-tech? That's not how I made it, but it works.

First thing, when I decided on this project, I looked up what other people had to say about discones. Two references were found: *The ARRL Antenna Book* and *Home-Brew HF/VHF Handbook* by William Hood. I found Mr Hood's book to be particularly useful.

Defining the Project

A discone is a vertically polarized antenna with a disc (a capacitive hat 0.68 x the base width) on top and a cone a quarter wavelength at lowest frequency, from the vertex (the point at the top) to the edge of the base (an equilateral triangle from the side). The base is a quarter wave in diameter (see Figure 1). Mr Hood states that the disc should be spaced 6" from the cone vertex at 14 MHz (no formula was given). A discone should operate over a large frequency range. My plan was to use it on 10 and 15 meters. I took these numbers and plugged them into my pocket computer to run them a few times.

```
10:  Input F
20:  B=492/(2*F) or B=150/(2*F)
     for metric
30:  D=0.68*B
40:  Print B,D
50:  Go to 10
```

Nothing fancy here—just the bare bones. Where F equals the lowest usable frequency, B equals base diameter and D equals the disc diameter.

The final design used 20.5 MHz as the lowest frequency because the SWR is supposed to rise rapidly at the lowest usable frequency. 20.5 MHz is a little below the 15 meter band, but I wanted the SWR to be low all the way to the bottom of the band. And it made the math easy. My final dimensions were 8'2" for the disc, 12' for the cone, and 4" for the spacing (I guessed for the spacing).

Before beginning I had to determine the number of radials to use. My reference book said one radial every 1/50 of a wave. That would be 38 or 40 radials. I didn't believe this number, so I did some experimenting.

Modeling

I decided to build a model. The commercial FM band (88-108 MHz) often uses dual polarization. A discone should work on the vertical portion. A tin can about 4" in diameter was used for the vertex, with a hole in the remaining end for the coax, and 12 small holes punched around the open end to attach the cone radials. The coax is fed through the open end, then through the coax hole, with the braid pulled back 2" and soldered to the can. The 2" of insulated center conductor is fed through a 1" thick, 8" wide wooden disk. Two short screws hold the can to the disk. Any insulation on the coax above the wood is stripped off. I poked a hole in the center of the tin can lid (the one removed to empty the can) and soldered it to the center conductor on top of the disk. The disc radials (six broken TV antenna elements cut to 11") were attached with screws, and the outside ends joined with a copper wire through a slit cut in the radials ends and crimped for a good mechanical connection.

Photo A. The discone.

After the top hat was up, I strung only two cone radials (stranded wire) from the can to start with (a stiff wire base loop was used to hold the radials in place). A small-diameter stick held to the vertex can by one screw was all the support needed. Hooking this up to an FM receiver with a signal strength meter, I was surprised to find it bidirectional. Adding a third was better. After six radials, gain was not noticeable on my equipment. I guess 1/50th of a wave for radial spacing meant without a base wire.

Since I planned on using a base wire to tie all the radials together, I decided on 15 radials per wave, or 12 for this antenna. I chose 12 radials for a better SWR on 10 and for lots of capture area.

Mounting Problems

The cone and disc for the full-size discone are very much like the test model's: a circle of plywood holding six elements, with the far ends shorted together to form the disc and 12 stranded copper wires hanging from a tin can and attached at the bottom to the base loop. The real problem is the supporting hardware. Holding up a tiny model is a lot easier than a disc over 8' across. The parts for this antenna sat around a long time before I finally came up with something I thought would work.

I always knew I'd use a 1-1/2" steel mast for supporting the antenna, but how could I attach it without any possibility of shorting out the cone and disc, yet still holding the disc 4" above the cone?

Mounting Solutions

The mount (spacers) consists of three pieces of 2x4 and a 5" circle of plywood (the 2x4s are 15", 8" and 3-1/2" long). First the 15" and 8" 2x4's were glued together (I used a hot glue gun) with their centers aligned (see Figure 3). A 1/2" hole drilled down the center gave me room to feed the coax through.

I heated up the glue gun again and stuck these two, the large end, to the bottom of the disc. I made sure that the hole in the disc and the spacers were lined up right. The can already had 12 holes punched in it for the radials and the coax hole in the remaining end. After slipping the coax through the hole I stripped off 5" of insulation, then bent

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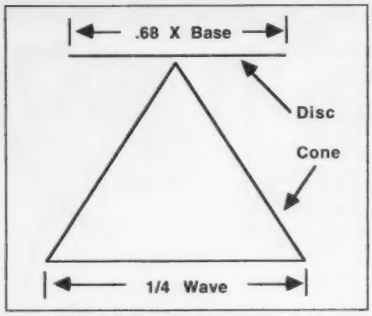

Figure 1. Discone measurements.

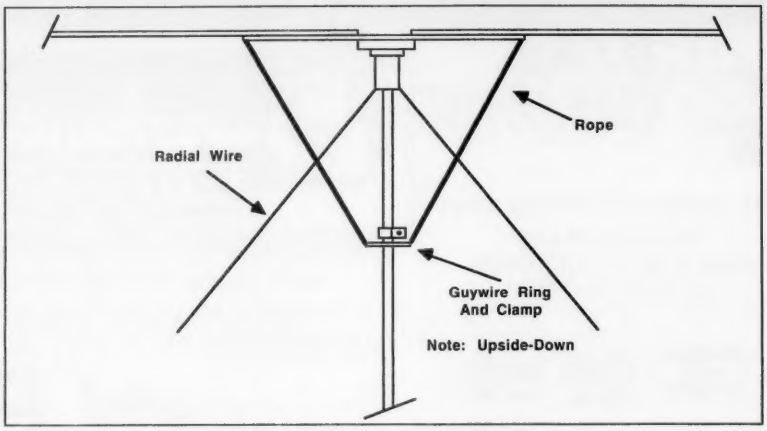

Figure 2. Guy ring mounting detail.

back and soldered the shield to the top of the can.

This is when I should have soldered the radials on to the can, but no, I did it the hard way. I slipped the center conductor through the center hole and, using more hot glue, pressed the can into place. I drilled a coax hole in the center of the 5" plywood circle and a mast hole in the 2x4 before gluing them together (see Figure 3). The plywood fit snuggly into the can. And the mast, with the coax slipped through it, fit snuggly into the 2x4 mast hole. This 2x4 collar keeps the mast from shifting. The plywood circle supports the weight of the whole antenna on the top of the mast.

Remember how on Field Day everyone puts up lightweight masts with guy lines? Now turn that picture upside down; that's how I hold the disc level. A guy line ring is mounted 3' down from the disc and four evenly-spaced ropes are tied from the edge of the 2' plywood disc to the guy ring (see Figure 2). This does a great job of holding the disc steady.

A stiff wire simply wasn't going to hold 12 radials in place as on the model. I used a stranded wire for the base loop and six 6' sticks (1" x 1"). Two parallel holes were drilled in each stick, one through each end. While soldering the radials to the base loop, I slipped a stick on after every two radials. When all the radials and sticks were in place and the base wire was soldered together, I brought all six ends together around the mast and threaded a rope through the end holes. Then, taking up the slack, I pulled them all tight to the mast, like the spokes of a wheel, and tied them off level with the base loop.

Wrap Up

When I turned on the receiver the first time I knew I had a winner, it worked great. Signals were coming in from everywhere. This antenna worked just like the books said it would: low SWR over a broad bandwidth, and a low angle of radiation for DX. At least this is true for the lowest 10 MHz I played with. Theory states the this discone should have a working bandwidth from 20.5 MHz to 205 MHz, but without VHF equipment I was unable to prove it.

My discone was fun to design, build and use. It had good receive and transmit qualities. I liked it, but it had some problems. Foremost, it pulls in signals from everywhere, not a good quality on crowded bands or in contests. With these qualities it might work well for a net control station, but not a good choice for your only antenna.

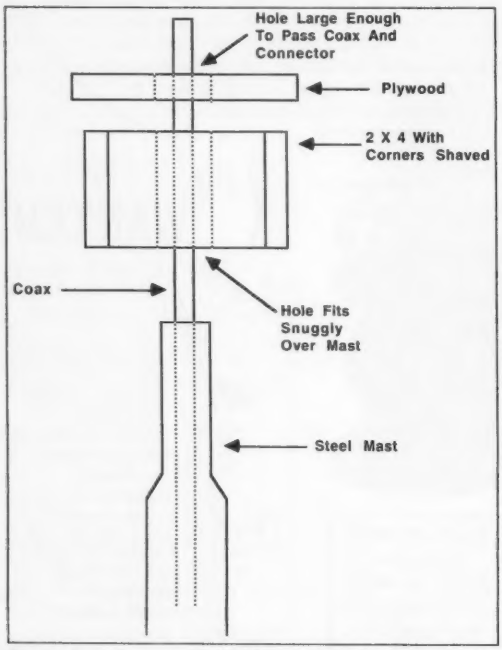

Figure 3. The 2 x 4 wood collar—plywood circle mounting detail.

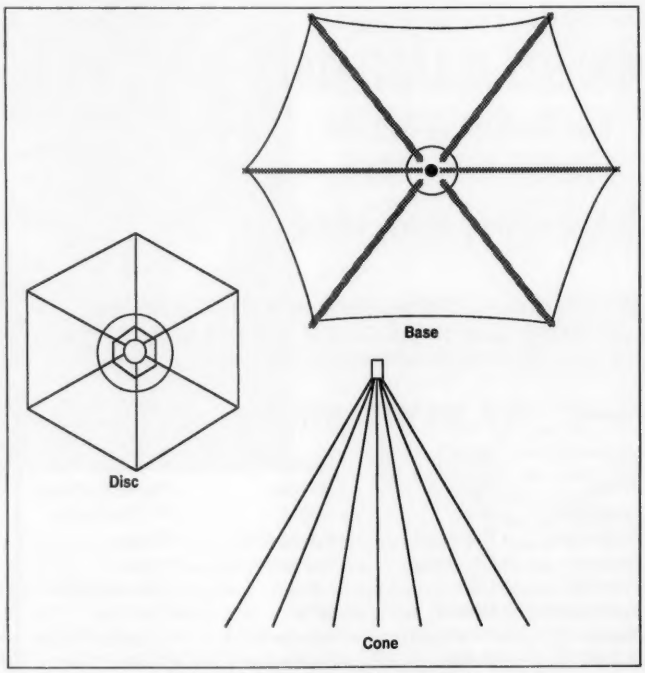

Figure 4. Base, disc, and cone detail.

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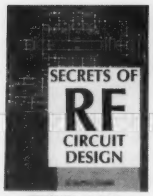

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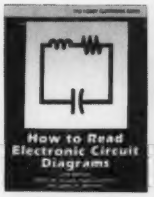

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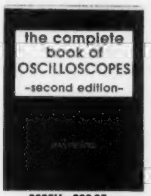

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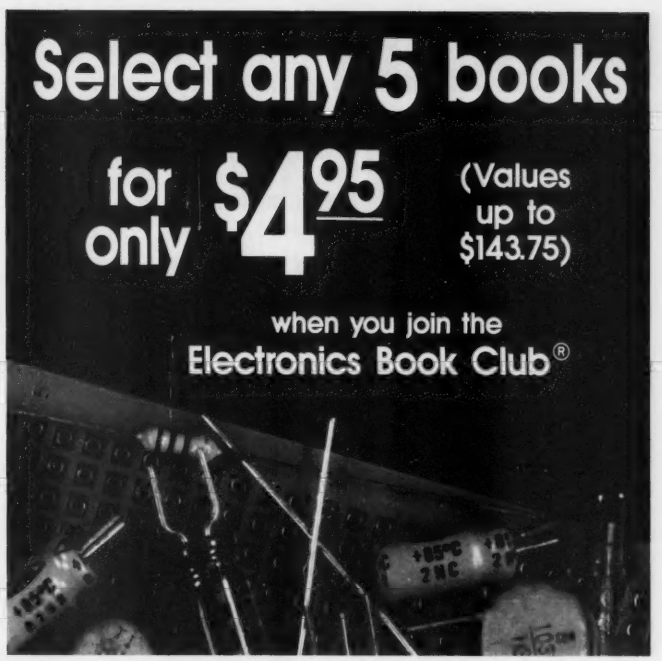

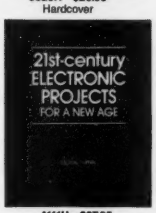

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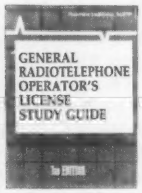

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My first antenna was a 40 meter dipole, stretched between two pine trees in the back yard. The center insulator was a piece of Plexiglas. The unsupported coax hung down from the center of the antenna and draped across the telephone wires, eventually making it into my bedroom window. Not having much in the way of adult electronic supervision, I had simply stripped the coax back and soldered it to the wires at either side of the insulator. This worked pretty well, and gave me a low VSWR as well as a feeling of great pride. I began racking up contacts that were several states away! However, it wasn't long before my range started to decrease. I tested the antenna, and the VSWR was still quite low. I didn't have a real power meter, but the meter readings on my trusty ol' Drake 2NT were the same as always. It even lit up my dummy load (100 watt GE Soft-White) as bright as always, but my buddy could barely hear me across town. What was up?

It took a visit from an Elmer to point out the obvious problem. In my haste to erect the antenna I had simply soldered the coax to the wires at the insulator. I hadn't even looped the coax over the insulator for strain relief. Rain was collecting on the dipole elements, running downhill to the insulator, and filling my unprotected coax up to the brim. It only took a few showers before my cheap TV-store coax had a saturated dielectric, and was acting more like a dummy load than a transmission line. I had plenty of power going into the line at the transmitter, but none of it was making it out to the antenna. My 75 watts of crystal-controlled CW signal was simply heating up the coax. In retrospect, it seems that anyone with half a brain would never have had this problem in the first place. However, it did teach me that things electronic are seldom exactly what they seem, even if the tools you have tell you that everything is in order.

The Solution: A Field Strength Meter

There was only one tool that would have given me an indication of my problem, and that was something that would have measured the strength of the actual field being radiated from the dipole. Strangely enough, the device is called a Field Strength Meter. (In actuality, the other method would have been to measure the power at the junction of the coax and the antenna. This method has been suggested in various texts, but I had a problem with it. For one thing, I didn't have a power meter. More importantly, I never figured out how to get up to the junction of the dipole when it's strung between two trees with the feedline dangling straight down. My family didn't own a bucket truck. (This is another one of those things they just didn't explain in the *Handbook*.) In any event, had I taken a couple of reference readings with a field strength meter and jotted them into my log book, I would have had a pretty good idea of where the problem was. At least I would have understood that there was a real problem, and that I wasn't just losing my marbles.

The DIGI-FIELD Field Strength Meter.

A new entry in the field strength meter field is the DIGI-FIELD unit, produced by IC Engineering of Encino, California. The DIGI-FIELD is a self-contained battery-operated field strength meter in a 3" x 4.2" x 1.5" heavy-duty plastic box. The unit comes with a 3-1/2 digit LCD display, an SO-239 connector, and an output jack for monitoring the demodulated (AM) signal. The range of the meter is from DC to 12 GHz, which should cover most of your ham applications. (By the way, IC Engineering is happy to supply spec sheets and charts on request.)

The basic design of any field strength meter is fairly simple. An antenna feeds an RF signal to a diode rectifier. The rectified voltage is then filtered by a capacitor, and the resulting DC voltage is measured by a meter. This system has worked fairly well for years. The only problem with it is that it takes a fair amount of energy to produce enough force to deflect even the most sensitive meter movement. In other words, the standard field strength meter tends to be somewhat "deaf." Several schemes are available to increase the sensitivity of the units—some use tuned RF filter circuits that resonate at the desired frequency, some use broadband amplifiers, some use a simple transistor amplifier that follows the detector diode.

The DIGI-FIELD meter approaches the problem from another angle. It does away with the mechanical meter movement, replacing it with a solid-state LCD display. The input impedance of the digital meter is much higher than any mechanical meter, so less voltage is required to produce a usable reading at a given frequency. The result is a higher sensitivity meter with no front-end to tune. As an example, a standard tuned-RF

single-transistor field strength meter was compared to the DIGI-FIELD. Feeding a signal into the standard meter with a signal generator produced a "usable" needle deflection with an input signal of 500 mV at 146.000 MHz. The DIGI-FIELD meter produced a "usable" reading with only 80 mV. (Since the field strength meters compared had mechanical and digital meters that both read in relative, not absolute, units, this type of test may seem like "comparing apples to oranges." However, the minimum "usable" reading was that deemed to be useful during an antenna peaking operation, similar to tuning up a transmitter or perhaps foxhunting. This was actually about one-quarter scale on the mechanical meter, and about 1.0 units on the digital display.) This means the DIGI-FIELD is able to pick up weaker, more distant, or lower power signals.

So who needs a field strength meter? Well, if you've just picked up your first ham license you'll probably want to invest in one or two other instruments first—a good DVM, maybe a VSWR bridge. Then, if you find yourself drawn to antennas and antenna design, a good field strength meter is a necessity. The DIGI-FIELD can be used to plot the gain of various yagi antennas you might be building, or to compare one antenna to another. You can compare the effectiveness of various styles of antennas on your HT. Reference values can be taken on your HF antenna to make sure its performance is up to par. Around the shack, a field strength meter can let you sniff out bad coax connections or improperly grounded transmitters. As an educational tool, the DIGI-FIELD can be used to demonstrate the concept of gain, or antenna polarization.

Using the DIGI-FIELD

Operation of the DIGI-FIELD is quite straightforward—you turn it on and plug an antenna into the SO-239. RF measurements will appear on the display. Like most field strength meters, the readings are relative, and are normally used in a comparative manner. For example, to adjust the spacing on a yagi for maximum forward gain you might set up the antenna and meter a reasonable distance apart, and key the transmitter. Note the reading on the DIGI-FIELD, and make an adjustment to the antenna. Take another reading, adjust accordingly, and so on. The sensitivity of the meter can be adjusted by moving the telescoping antenna up and down, or by connecting a conventional antenna to the input jack. The DIGI-FIELD does lack a bar graph display, which would be handy in operations that are looking only for a peak, such as foxhunting. However, the LCD display does respond quickly enough to allow these types of jobs to be performed—just not as easily.

All in all, due to its high sensitivity and wide bandwidth, the IC Engineering DIGI-FIELD represents a reasonable investment, and antenna buffs will find it to be extremely useful.

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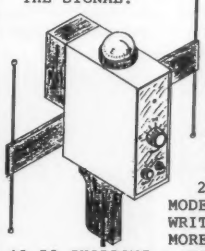

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The Boyd Electronics RF Sweep Generator

Building and experimenting with RF circuits can be performed with a simple continuous wave (CW) signal generator, but the avid technician quickly learns that an RF sweep generator is a real asset on the bench. A sweep generator repetitively tunes through its set range of frequencies, thereby allowing you to examine the frequency response of the circuit under test on an oscilloscope. Circuits that test better on a sweep generator compared to a CW signal generator include:

- High-pass and low-pass filters
- Bandpass filters
- L-C tuning circuits
- Antenna tuners
- Crystal, ceramic or mechanical IF filters
- RF amplifiers
- Video amplifiers
- IF amplifiers

Sweep generators are used by service technicians to test and align radio and TV equipment, and they are also used by engineers and technicians in laboratory settings. The service grade sweep signal generators may be cheaper than laboratory models, but they usually don't cover all frequencies that amateurs need. The lab models are in the multi-kilobuck price range, so they are out of the game as far as most hams are concerned. Perhaps the best alternative is to build your own sweep generator from a kit.

Last month, an advertisement by Boyd Electronics (1998 Southgate Way, Grants Pass OR; 503-476-9583) in *73* caught my eye. They offer the Model RSG-30 RF sweep generator as a kit at a very attractive price. So, I contacted Jerry Boyd, and he shipped an RSG-30 kit for review. (He also offers two assembled versions, but considering most hams would probably build the kit, I wanted to assemble this one myself. Besides, building stuff is one of the fun parts of doing this column.)

RSG-30 Features

The Boyd RSG-30 offers sweep from 2 to 30 MHz, and has the standard 50 ohm load needed for RF circuit testing. The output level is approximately 100 mV RMS, and sweep width is variable from 5 kHz to 30 MHz. A negative 12 volt, 20 ms trigger pulse is provided so the oscilloscope can be triggered in step with the sweep (which makes the presentation coherent).

Three modes are offered in the Boyd RSG-30: CW, Video and Symmetrical. The CW mode outputs a continuous, non-swept signal (Photo A) on a single frequency set by the front panel FREQUENCY control. It can be used in the same manner as any RF signal generator. The VIDEO mode is a swept mode in which the RF frequency is swept from 2 to 30 MHz, while the SYMMETRICAL mode is a swept mode in which the width of the sweep (min to max frequency) is set by a SWEEP WIDTH control on the front panel (5 kHz to 30 MHz). Photo B shows the waveform on my oscilloscope when the SYMMETRICAL mode was selected and the SWEEP WIDTH was set close to maximum (so it is similar to the VIDEO mode).

"The lab models are in the multi-kilobuck price range, so they are out of the game as far as most hams are concerned. Perhaps the best alternative is to build your own sweep generator from a kit."

RSG-30 Internal Circuitry

Figure 1 shows the block diagram of the Boyd RSG-30 circuitry. The RF signal is formed by mixing together two other signals: the output of a 50 MHz crystal oscillator, and a 52 to 80 MHz voltage tuned oscillator (VCO). A VCO is a circuit in which the RF frequency is set by a tuning voltage applied to a voltage variable capacitance diode (or "varicap"). The output of the mixer is the 2 to 30 MHz difference between the crystal oscillator (XO) and VCO signals, and this signal is filtered in a low-pass filter to remove the remaining components of the XO and VCO. The 2 to 30 MHz filtered signal is amplified by a Mini-Circuits MAR-1 MMIC amplifier. These amplifier ICs have a natural 50 ohm output.

The sweep and tuning voltage section contains a clock-driven sawtoothed generator, as well as DC offset circuitry for setting the center frequen-

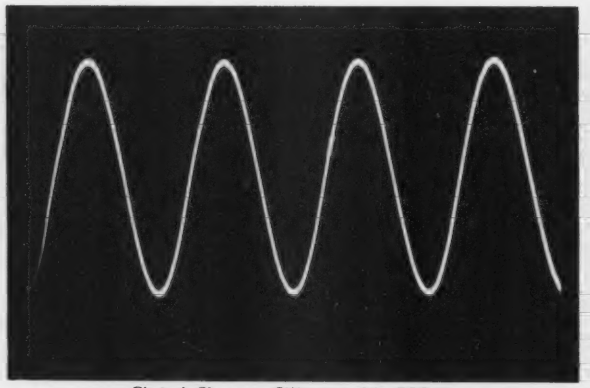

Photo A. Sine wave CW output of the RSG-30.

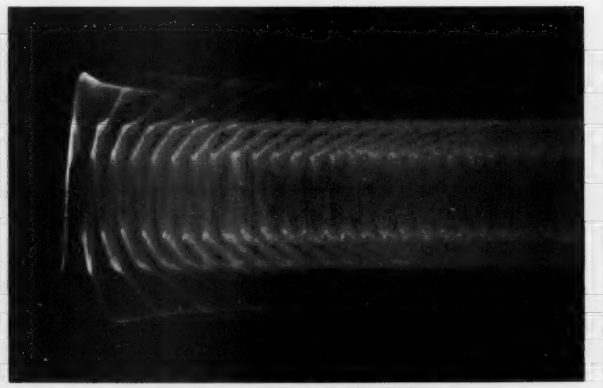

Photo B. Swept RF output of the RSG-30.

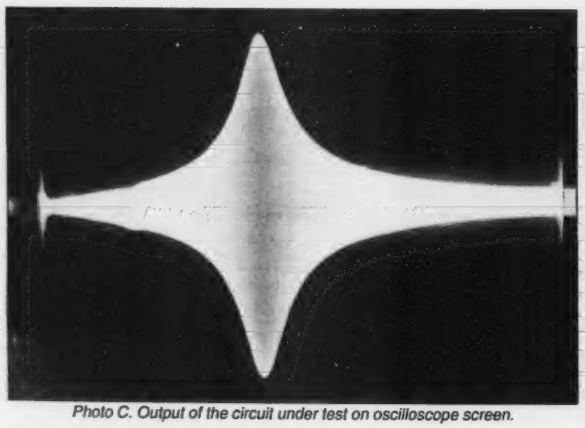

Photo C. Output of the circuit under test on oscilloscope screen.

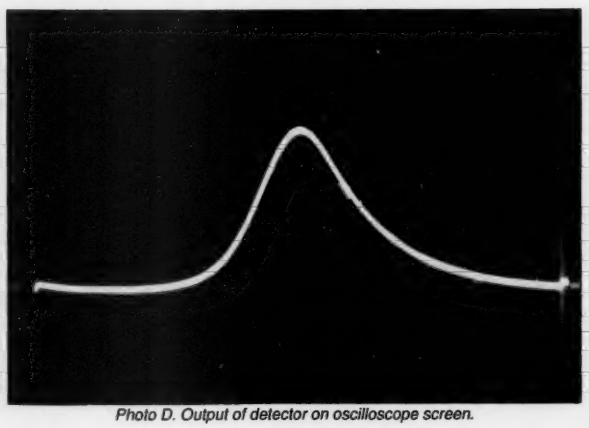

Photo D. Output of detector on oscilloscope screen.

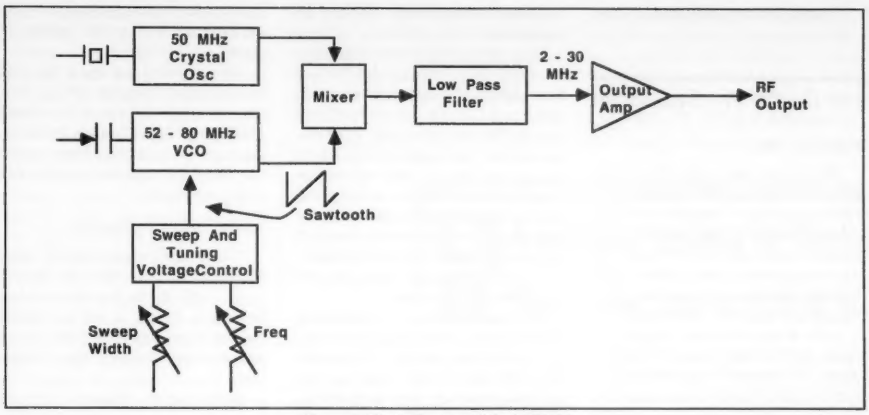

Figure 1. Block diagram of the RSG-30.

cy. The saw-toothed waveform allows the VCO to sweep linearly from a low to high frequency, and then snap back to the low frequency end of the swept spectrum. Both the sweep width and center frequency controls are part of the sweep circuit.

Using the RSG-30 RF Sweep Signal Generator

There are two basic ways to use the Boyd RSG-30 sweep signal generator. If you have an oscilloscope that has a 30 MHz (or greater) bandwidth, or if you can be satisfied limiting the RSG-30 to a lower bandwidth (say, 10 MHz), then the RSG-30 can be hooked up as in Figure 2. The SYNC connector on the rear panel of the RSG-30 is connected to the EXTERNAL TRIGGER input on the oscilloscope. The RF output of the RSG-30 is fed to the input of the circuit under test (CUT). The output of the CUT is fed to the high frequency vertical input of the oscilloscope.

Photo C shows the waveform to expect when the RF is viewed directly. This particular trace was taken when the CUT was a 10.7 MHz IF transformer (the type used in FM broadcast receivers) A narrower filter would produce a similar trace, but with less width. In some cases, users prefer to lower the trace to the oscilloscope baseline so that only the top portion of the symmetrical waveform shows.

Many amateurs have oscilloscopes these days, but many of them are low frequency oscilloscopes found at hamfests, government surplus, industry, or electronic repair shops. These oscilloscopes are not suitable for direct use with the RSG-30. If the hook-up of Figure 2 is broken at "X," however, we can insert a detector circuit. Some people use a demodulator probe for the oscilloscope, while others use the circuit of Figure 3. This circuit should be built inside a small shielded metal box. It consists of a diode detector (D1) and a filter capacitor (C2). The other capacitor is used for DC blocking to prevent any DC from the CUT from messing up the diode.

The diode used in Figure 3 is a germanium detector diode such as 1N34 or 1N60. These diodes are usually available at Radio Shack or at electronics parts places that sell Jim-Paks. Another source of the diodes is the service shop replacement lines of semiconductor such as NTE or ECG products. In those lines, the ECG-109 and NTE-109 are suitable.

Photo D shows the waveform to expect when using the diode detector. This waveform was taken from a 40 meter RF tuned circuit consisting of a disk ceramic capacitor and a 4.9 µH toroidal inductor. The diode detector and filter removes the residual RF, and presents just the instantaneous DC output of the detector.

Boyd Electronics offers the RSG-30 in several ways. First, you can buy a kit consisting of the printed circuit board and all parts needed for the PCB board (RSG-30K). This costs $59.95. They will also assemble and test this version for $119 (order RSG-30A). For these options you will have to supply certain mechanical parts and the cabinet. Boyd Electronics gives you the Radio Shack part numbers. The company supplies a pair of adhesive templates that stick to the front and rear panels, and give the unit a real professional look. If you want the RSG-30 with a cabinet, then order RSG-30C for $159.

Next month, we will take a look at some sweep generator applications, including a low frequency adapter for the RSG-30 that permits it to be used below 2 MHz.

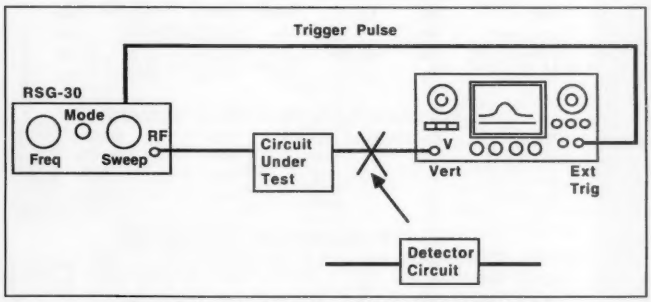

Figure 2. Normal set-up for the RSG-30 to test an RF circuit.

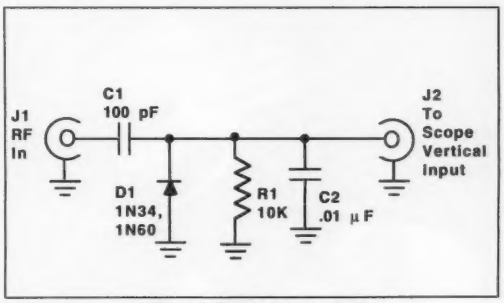

Figure 3. Simple detector circuit.

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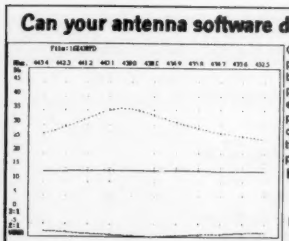

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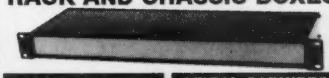

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1RU10	19 x 10 x 1.75	36.25	MC-3A	8 x 3 x 2	20.95
2RU5	19 x 5 x 3.5	33.10	MC-4A	4 x 4 x 3	18.75
2RU7	19 x 7 x 3.5	36.25	MC-5A	6 x 4 x 3	20.95
2RU10	19 x 10 x 3.5	37.80	MC-6A	8 x 4 x 3	23.15
3RU5	19 x 5 x 5.25	41.90	MC-7A	4 x 7 x 4	20.95
3RU7	19 x 7 x 5.25	44.10	MC-8A	6 x 7 x 4	23.15
3RU10	19 x 10 x 5.25	46.30	MC-9A	8 x 7 x 4	25.75

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At this time last year, AMSAT-OSCAR-13 was in perfect operating condition. The satellite was more than four years old and performing flawlessly. In recent months though, the situation has changed.

In May, the transmitter section of the "JL" mode transponder (23 cm or 2 meters up with 70 cm down) stopped working. All attempts to bring the 70 cm transmitter back on line failed. Studies of the satellite telemetry indicated that the exciter portion of the transmitter was functional but the power-amplifier section was not. This turn of events has placed greater emphasis on the popular mode "B" (70 cm up and 2 meters down) and more exotic mode "S" operation (70 cm up and 13 cm down).

Satellite controller James Miller G3RUH has reported that the 23 cm receiver still functions well and is being used for satellite control activity. G3RUH, DB2OS and VK5AGR have revised the 1993 and 1994 operating schedule without mode "JL" for A-O-13. It appears in Table 1. No further anomalies have been reported.

Field Day 1993

The loss of two modes via A-O-13 did not dampen satellite activity during Field Day in June. Passes over North America for both high and low orbit satellites were almost continuous for the 24-hour event. Many times, more than one active hamsat was above the horizon and available for contacts.

A-O-13 was excellent, especially during the morning hours of Sunday June 27th. Modest directional antennas provided many portable stations "armchair copy" when the satellite pointing angle favored their locations. While most stations focused on mode "B" operation, a few tried "S" reception on 2400 MHz with loop yagis, helix arrays and small dish antennas. The two-foot dish used at K5DX by our group did not work, but later investigation of the downconverter circuitry revealed some minor wiring errors. The two-footer (an old snow coaster) with a Down East Microwave converter (RR 1 Box 2310, Troy ME 04987; Tel. 207-948-3741, Fax: 207-948-5157, catalog available) can hear the satellite when properly connected and aligned. Steve KE5O heard several stations working mode "S" on Field Day, and worked one. His system included a surplus six-foot dish and a patchwork downconverter with a 7 dB noise figure and no preamp.

Many other satellites were available for Field Day. Fuji-OSCAR-20 had been commanded to the analog mode (voice and CW) for the event. RS-10 was working well with mode "A" (2 meters up and 10 meters down). RS-12 was on, but the 15 meter uplink was overrun with terrestrial activity; the earth-bound operators were obviously unaware of their interference with satellite operators. AMSAT-OSCAR-21 was in the FM repeater mode using 70 cm up and 2 meters down.

The microsats were operational with 1200 bps PSK (phase-shift keying) on LUSAT-OSCAR-19 and AMSAT-OSCAR-16, and 9600 bps on UoSAT-OSCAR-22 and KITSAT-OSCAR-23. ARRL Field Day rules do not recognize contacts with the digital satellites, but the concurrent AMSAT Field Day rules encouraged uploading Field Day greeting messages and downloading messages sent to the flying BBSs by other groups working the event.

Mir was in the sky and a few lucky folks managed contacts with the Shuttle Amateur Radio EXperiment (SAREX) on STS-57. N5WQW operated some voice, and on some passes the W5RRR-1 robot was available for packet connects.

AMSAT Space Symposium

The eleventh annual AMSAT Space Symposium will be held from October 7-10, 1993, at the La Quinta Inn in Arlington, Texas. It will be hosted by the North Texas AMSAT Group and promises to be a great weekend.

Beginning on Thursday morning, October 7, at 9 a.m., those attending are invited to meet at the La Quinta Inn (State Highway 360 and Interstate 30) for a tour of various electronic surplus stores in the Dallas/Fort Worth

Photo A. Field Day 1993 at K5DX in central Texas. WA5ZIB repairing the 9600 bps TNC for U-O-22 and K-O-23 contacts.

A-O-13 Provisional Attitude Schedule 1993-4

Date	[Mon]	Alon	Alat	SA	to	SA	Weeks	Notes
1993	Aug 09	180	-10	36		28	2	
1993	Aug 23	180	0	35		-33	9	
1993	Oct 25	210	0	-14		-36	3	<81% Moon eclipse Nov 13
1993	Nov 15	240	-5	-13		-35	11	] Up to 137 minute eclipses
1994	Jan 31	180	0	-36		36	9	] MA 110-144 Dec 07 - Dec 23
1994	Apr 04	210	0	19		38	3	
1994	Apr 25	230	0	21		33	11	
1994	Jul 11	180	0	36		-41	10	
1994	Sep 19	210	0	-25		-37	2	
1994	Oct 03	230	0	-20		-28	10	] Up to 134 minute eclipses
1994	Dec 12	180	0	-41		—	—	] MA 96-108 Oct 22 - Nov 06

Eclipses of Sun by Earth 1993/4 - Summary

Start	MA	Max	Mins	MA-MA	Stop	MA
1993 Dec 07	110	Dec 15	137	109-160	Dec 23	144
1994 Mar 22	254	May 23	23	251-004	Jul 20	001
1994 Oct 22	96	Oct 29	134	79-128	Nov 06	108

Eclipses of Sun by Moon 1993/4 - Summary

Date	Duration (Mins)	Obsc%	Orbit	MA-MA
1993 Nov 13	160	87	4148	172-209
1993 Dec 13	55	52	4211	74-94
1994 Dec 03	30	68	4855	12-23

A-O-13 Provisional Mode Schedules 1993

*** A-O-13 TRANSPONDER SCHEDULE *** 1993 Aug 09-Oct 25
Mode-B : MA 0 to MA 60 !
Mode-BS : MA 60 to MA 120 !
Mode-S : MA 120 to MA 145 !<- S transponder; B trsp. is OFF
Mode-S : MA 145 to MA 150 !<- S beacon only
Mode-BS : MA 150 to MA 210 ! Alon/Alat 180/0
Mode-B : MA 210 to MA 256 !
Omnis : MA 230 to MA 40 ! Move to attitude 210/0, Oct 25

*** A-O-13 TRANSPONDER SCHEDULE *** 1993 Oct 25-Nov 15
Mode-B : MA 0 to MA 130 !
Mode-BS : MA 130 to MA 180 !
Mode-S : MA 180 to MA 205 !<- S transponder; B trsp. is OFF
Mode-S : MA 205 to MA 210 !<- S beacon only
Mode-BS : MA 210 to MA 226 ! Alon/Alat 210/0
Omnis : MA 240 to MA 80 ! Move to attitude 240/0, Nov 15
Please don't uplink to B, MA 180-205. Interferes with Mode S.

*** A-O-13 TRANSPONDER SCHEDULE *** 1993 Nov 15-Jan 31
Mode-B : MA 0 to MA 220 !
Mode-S : MA 220 to MA 230 !<- S transponder; B trsp. is OFF
Mode-BS : MA 230 to MA 226 ! Alon/Alat 240/0
Omnis : MA 250 to MA 150 ! Move to attitude 180/0, Jan 31
Please don't uplink to B, MA 220-230. Interferes with mode S.

Table 1. Provisional event schedule for A-O-13 through 1993 and 1994.

area. Transportation and a guide will be provided.

Official registration begins Friday morning at the Inn. An antenna test range will be set up near the hotel for those wishing to test their favorite satellite antennas. The first of many fine technical papers will be presented Friday afternoon in the La Quinta Conference Center. Friday evening is open for dinner with friends and family or a visit to the stadium next door for a Texas Rangers baseball game.

Saturday begins early with a full day of presentations and demonstrations. This is a great opportunity to find out what's new in the amateur satellite field. Topics include the Phase 3D satellite project, Pacsats, DSP modems, microwave communications and much more.

Saturday evening starts out with the traditional "attitude adjustment" hour followed by a banquet dinner with keynote speaker. Presentations and prize drawings follow 'til almost midnight. While dress is casual for the symposium, jeans are not suggested for the banquet.

For those who can stay, Sunday activities include a beginners' forum and other technical sessions. There is also the AMSAT Board of Director's meeting in the afternoon.

Access to the area is easy. For those flying in to DFW airport, there is a free hotel shuttle to the La Quinta Inn. Call the La Quinta at 1-800-531-5900 to reserve your room before September 24th to get special rates of $50 for a single, $55 for a double or $60 for a triple/quad. Suites are also available.

To preregister for the AMSAT Symposium, send $15 for registration only, or $35 for registration and the Saturday night banquet to: 1993 AMSAT Symposium, Route 1 Box 291, Waco TX 76712. Preregistration is encouraged for those wishing to attend the banquet. This will be the third time the AMSAT Symposium has come to Texas and it promises to be one of the best. I'll see you in Arlington. 73

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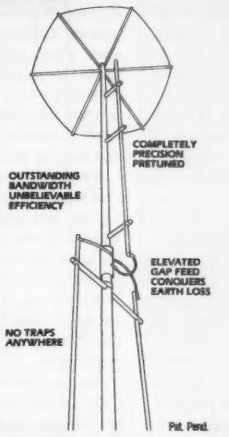

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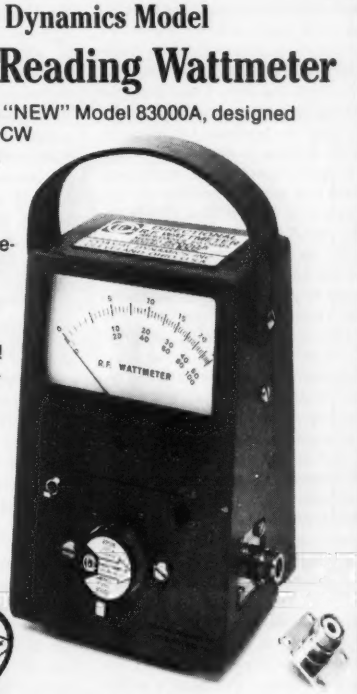

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PACKET & COMPUTERS

Jeffrey Sloman N1EWO
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Comments from the Survey

Yes, it took a long time, but I am finally getting a chance to compile the information from your survey responses. I am going to do this in two parts: This month I'll look at some of the comments and respond to them; next month (along with a special treat for those of you interested in TCP/IP), I'll give you the tabulated "statistics."

First, I really want to thank those who took the time to respond; your comments were thoughtful and helpful. I also want to thank those of you who made kind remarks about the column—a lot of what you said (perhaps without you even knowing it) gave me the impression that this column is a success. Though I can't please everyone, I want to provide you with information that is *useful* and understandable. You tell me I have been doing that. I even got a few suggestions on what I am doing wrong; I need those too. Please do not hesitate to let me know what you think. Just because the official survey may have ended doesn't mean that I want your input to end too! Write to me at the address at the top of the column or, much better, at my electronic mail address on the Internet: jsloman@bix.com. I really enjoy hearing from you on packet, too, but PLEASE—no business! I have had to ignore a couple of requests for things like reprint permission that have come that way. To contact me via packet use: N1EWO@N0ARY.#NOCAL.CA.USA.NOAM.

OK, on to the comments. Many of you had very similar things to say, so I tried to pick representative examples. I wish I had the time and space to discuss every response—really. Bill N6XIV asks for " . . . more entry level plain talk . . ." and is joined by Joel N2GOA who says, "KISS, for me, anyway." I am pretty sure that Joel is asking me to "Keep it Simple, Stupid" and not something that my wife needs to be jealous about. Other comments in this vein come from Bill N8NJA who asks that all ham radio writers keep this idea in mind, and Roger WD8DJR who laments the poor quality of some TNC manuals and asks manufacturers to "walk a new user through a complete setup." To those of you with these feelings, I will endeavor to provide you with the basic information you seek. I understand your frustration with the incorrect assumption made by many technical manual writers that everyone knows a lot more than they do. I struggle with this in all of my technical writing—being reminded doesn't hurt.

On the other end of the scale, Don KI5SS asks for articles on "advanced topics," listing data lists, block diagrams of multimode stations for satellite ops, and equipment lists for setting up those stations. I think you will find what you want, Don, in future issues. Steve N8AMW will also get what he asks for—technical info on PACTOR, an exciting new mode which is catching on like wildfire.

A lot of you, including Mitchell KC6SXY, asked for practically-oriented columns—something I like to do anyway. You'll be seeing lots of those. Mitchell also went on to give some good advice which he asked me to pass on: "Tell people they should *never* install a board into their computer without also carefully recording and attaching to the machine what they have installed and the settings. They should also immediately place the manuals in a cherished, preserved three-ring binder. Without these steps you may end up with a computer that is a total mystery to you." (I hope Mitchell doesn't mind the copy editing—my editors do it to me all the time.)

I agree with Mitchell on this one, and I have never discussed it here so thanks for bringing it up. The IBM-PC allows us the flexibility of inserting multiple adapter cards but, unfortunately, it has no way of automatically keeping track. Today there is a proliferation of communications and I/O (Input/Output) devices. The average computer user can insert these in his or her machine: scanners, fax boards, internal modems, internal TNCs, network cards, voice mail boards, and even more. The biggest problem is that all of these cards are competing for certain limited resources.

The IBM-PC has four types of resources that hardware adapters might want or need:

IRQ (Interrupt ReQuest line or level)
I/O port addresses
Mapped memory addresses
DMA channels (Direct Memory Access)

IRQ

The IBM-PC uses an *interrupt driven* architecture. What does that mean? It means that the designers of the PC decided to implement a system of hardware services that relies upon a request from the hardware device. How you service your hardware's needs is a basic problem of computer design. To make this a little clearer, let's take a look at a familiar example—the com port.

The PC com port is an asynchronous device; that is, the data can appear at any time. Its flip side is the synchronous communications port, which is controlled by a standard clock on one end of the connection. With the PC's async port, timing is controlled by start and stop bits sent with the data. If you don't completely understand, don't worry—here's the bottom line: Since the Central Processing Unit or CPU (the computer equivalent to a brain) can't tell when the data is going to appear at the com port, it can do one of two things. It can keep checking the port over and over to see if anything is there, a process called *polling*. Or, as the PC does, it can wait for an interrupt request—sent by the com port when it gets data—and then service it. You can see now why it is called an "interrupt": It literally interrupts the CPU and asks for service.

On the PC the interrupts have various priority levels with "0" having the highest and higher numbers getting lower in priority. IRQ0, for example, is the timer interrupt—think of it as the computers heartbeat. The AT version of the PC has 16 interrupts, though not all of these are available for your use. Some interrupts are reserved for the system.

As you can see from Table 1, IRQs 11, 12, 14, and 15 are "officially" available. The trouble is, you need a 16-bit card to use these! Why? An IRQ is a physical hardware connection to the bus. A 16-bit connector is needed to make those physical connections to the higher IRQs. Though it is changing, many cards still cannot use the higher interrupts.

What can you do? Fortunately, some of the "reserved" IRQ slots are rarely used by the hardware that is supposed to use them. For example, you can probably go ahead and use IRQs 5 and 7 without any ill effects. If you do not have a com port set for COM1 or COM2, you can use the associated interrupt. You can even "share" interrupts in some cases. This is risky business, though. First you have to find two boards that can get along with each other. This usually works best in the case of something like a scanner (image, not police!) that doesn't "wake up" until its special software is loaded. You can share the IRQ with another piece of equipment that is also well behaved AND WON'T BE NEEDED AT THE SAME TIME. In any other case, each adapter needs its own IRQ. So back to our original advice of writing stuff down: You need to know which IRQs are available when it is time to configure that new board.

I/O Port Addresses

Another resource, less scarce than the IRQs, is I/O port space. This is a memory space, distinct from RAM (Random Access Memory)—the place programs live while running—which is used to let hardware transfer data to programs. I/O ports are usually specified in terms of a "base address"; this indicates where the I/O port begins in memory. Many adapters use I/O ports—sound cards, scanners, NICs (Network Interface Cards), and fancy display adapters are a few examples. Conflicts among cards for I/O space is not too common—but it does happen. Sound cards and scanner boards are often culprits. Most are flexible enough in where they can live that you will be able to find a spot that doesn't conflict. On the other hand, keep in mind that you may have two pieces of hardware that just don't get along!

Mapped Memory Addresses

Though it used to be uncommon, using mapped memory seems to be becoming more popular. This technique takes up a number of memory addresses in the 640K to 1024K range—(known as the Upper Memory Area or UMA) and *maps* the data to some memory that is physically resident on an adapter. This is much faster than I/O port techniques, and so you will find it on display adapters, NICs, and other applications which have to move a lot of data. The UMA space was set aside by PC designers for this purpose but was recently taken back to "load high" programs and the like. This is where a conflict might occur. In the context of our current discussion, write this stuff down with the rest of your information so you can tell if you've got a conflict between two adapters.

DMA Channels

The last of these resources are the DMA channels. DMA means Direct Memory Access, which is a technique to allow adapters to quickly access information stored in your RAM—without the assistance of the CPU. This is very important to some operations performed by scanners and other devices which have to move a lot of data in a hurry. On the AT there are seven DMA channels, but not all are available. This is usually not a source of conflict, but, if you have a sound board, you may do some juggling before you can install a second DMA-using board.

What Should You Write Down?

Make yourself a little chart with a line for each slot in your computer (you can't install more boards than slots!). Across your chart put the following headings:

Manufacturer
Model
Serial Number
Function
IRQ
I/O Port
DMA Channel(s)
Mapped Memory

Manufacturer is obvious: Who made the thing? Model and serial number are *very* important. When it comes time to get tech support help, this may just save you the time and frustration of opening your machine

Continued on page 51

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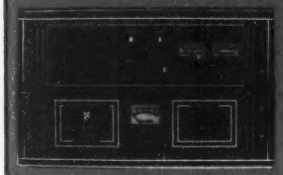

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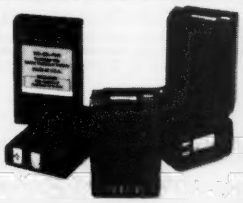

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RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

I thought I might take this month when the kids are going back to school to play professor, myself, and answer some of your questions.

We'll lead off this month with an Email message that arrived via America Online. Matthew Mucker KB5FWG says that he has two very beginner-level questions for me. As a college student on a budget, he has never exercised the privileges ham radio offers. He's been monitoring 144-148 MHz in Houston, though, and wants to get in on the action, but his budget, and good ol' ham radio spirit, has prompted him to try to build his own 2 meter radio. Looking through two or three current magazines, he has not found any which give detailed information. He is looking for references he could use to accomplish this task.

Second, while perusing the ads in the magazines (one would hope *73*), he has read an article or two about packet radio. He's heard that packets are relayed all across the country. How does this work? He assumes that a station broadcasts the message and a local repeater will pass it along. "How do I get started in this? It sounds a whole lot cheaper than calling long distance!"

Let's deal with the second question first. I'll try to simplify an overview of packet radio in just a few short sentences. Purists may quibble, but I'll try to be accurate. To begin with, the "packets" of packet radio are not messages themselves, but discrete bundles of characters which may contain several kilobytes of information. The contents of a transmission may therefore be made up of one or many such packets. Each packet carries with it an address, the intended recipient. Now, if you are sending to the recipient directly, there is no need to repeat the information. But, if not, the packet is received by an intermediate station, held in a buffer, and then retransmitted, to be picked up by the next station down the line. This might be the recipient, or another repeater. Unlike voice repeaters, however, which simultaneously retransmit received information on another frequency, digital repeaters, or digipeaters, receive and transmit on the same frequency. The transmissions take place only after listening to be sure the frequency is clear, and many transmitters may swap in and out with packets, all taking turns. Isn't that nice? And no, it may sound cheaper than long distance, but all that packet switching can take quite awhile, so it ain't faster. Additionally, remember, this is still a hobby, so no business messages via packet, not even to this columnist!

All you need to get started is a VHF transceiver (we'll discuss that in a minute), some kind of terminal, which can be a computer or dumb terminal, and a terminal node controller, the packet equivalent of a modem. These come in various styles and prices, from ultra-cheap to ultra-sophisticated. There are even computer programs which can substitute for the TNC; our "RTTY Loop" disk collection has a few worth looking at.

Two references I can recommend are: *Digital Communications With Amateur Radio*, which can be purchased at your local Radio Shack, or ordered as a special edition from AEA Inc., P.O. Box C-2160, Lynnwood WA 98036; and *The Digital Novice*, by Jim Grubbs K9EI, QSKY Publishing, P.O. Box 3042, Springfield IL 62708.

I don't have current pricing information on either book, but they are both good, and cover the material in different ways. Be sure to mention "RTTY Loop" to them when you write—maybe it'll get you something, maybe not!

Now, as to the other question, that of building your own 2 meter transceiver. Are you sure you want to do this? There are some kits available. One source that has been around for years is Hamtronics, Inc., 65 Moul Road, Hilton NY 14468. They have various transmitter and receiver boards in the hundred dollar and up (and up) category. You may do as well, and grow less gray hair, if you look into used equipment in your area. Ham clubs, hamfests, and just asking around may turn up a bargain. Even an old handheld might be all you need to get onto a digital mode. For all I know, two days after this column runs, every ham in Houston will be calling you to offer help. Just hold your solder for a few days, and let me know what happens, okay?

Shifting gears, as we often do in this "Loop": Matthew F. Judge dropped me this question via the CompuServe network. "I was reading your column in *73*, and was hoping you could answer what may be a stupid question. I am writing a new computer-aided dispatch system for my police department. As such, I would like to put our TDD system in the PC. Is the RTTY Baudot code the same as the Telecommunications Device for the Deaf Baudot code? I have not been able to find any difference listed. If there is no difference, could you point me towards some RTTY Baudot software (must be in Windows)?"

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Well, the reason that you have not been able to find any difference between amateur Baudot and TDD Baudot is that there isn't any! After all, much of the early work in establishing the TDD standards was done by amateurs in groups like the Telephone Pioneers, working with discarded Model 15 and Model 19 teleprinters. The only major difference is that the tone pairs used in signaling on amateur AFSK and FSK circuits are different than TDD tones, which are based on telephone modem frequencies.

Any of the "TU-less" computer programs should work, as long as the proper interface to telco is provided. Again, there are several programs in the "RTTY Loop" collection you may be interested in. See the end of the column if you are interested in these materials, and good luck with this worthy endeavor.

Finally, something sentimental. Long-time readers of this column may remember my love affair some years back with the Motorola 6800 CPU. The father of the 6809, and grandfather of the 68000 series that powers Macintosh computers, this incredibly powerful computer never really took off. Well, here is a letter from John C. Delaive VE4YD of Winnipeg, Canada, who still has faith. He is running a system under OS-9, the multi-tasking, multi-threading operating system for the 6800/6809 that predated OS/2 by a decade, with the original Stylo word processor, Dynacalc spreadsheet, and a RTTY program to boot! He offers assistance in locating boards or supplies for this system. Interested parties may drop me a line and I will forward the information to him directly. Thanks for the memory, John.

I have mentioned the "RTTY Loop" collections a few times. For those who came in late, I have four disks worth of programs, with collections #1, #2, and #4 being RTTY, packet, and amateur radio programs, and #3 the collection of archiving utilities. Each collection will fill a 3.5", 1.44 Mb disk, or appropriately more disks of lesser capacity. If you would like any or all of these collections, simply send me sufficient media (5.25" or 3.5") to hold the stuff (no need to format the disks), a self-addressed stamped mailer to return them to you, and $2 in US funds for each disk enclosed. If you would just like a listing of all the programs, send a self-addressed stamped envelope to me and request the collection listing. Sure, I can send that to you via Email as well, on any of the usual networks. Send comments, questions, and critiques to me by mail at the above address, or on CompuServe at 75036,2501; America Online at MarcWA3AJR; or Delphi at MarcWA3AJR. I look forward to it! 73

PACKET & COMPUTERS

Continued from page 48

to get this info. Try to record the whole model number, and any revisions if you see them on the Printed Circuit Board or PCB. Record this information in the manual too, for easy access. Function means: What does the board do? Don't laugh, this may be necessary if you can't remember—and it happens! Finally, record the IRQ, I/O, DMA, and Mapped Memory information so that when it comes time for a new board's configuration, you won't end up in a hair-pulling fit.

Next Month

We'll take a look at an interesting new product—using TCP/IP—that is a one-board (!) packet station. We're talking the whole station here, including radio. Talk about space saving. We'll also get a look at the "statistical" part of the survey information. 'Til then 73 de N1EWO. 73

IRQ0:	Timer
IRQ1:	Keyboard
IRQ2:	PIC (Programmable Interrupt Controller)
IRQ3:	COM2 and COM4
IRQ4:	COM1 and COM3
IRQ5:	LPT2
IRQ6:	Floppy Disk
IRQ7:	LPT1
IRQ8:	Real Time Clock
IRQ9:	Connected to IRQ2
IRQ10:	available
IRQ11:	available
IRQ12:	available (PS/2 mouse)
IRQ13:	Math CoProcessor
IRQ14:	Fixed Disk Drive
IRQ15:	available

Table 1. The PC-AT computer has 16 IRQs but some are used for the system. See the text for more.

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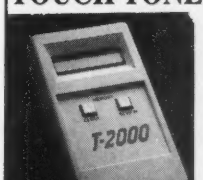

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RDF Adventures in Ham Radio Fiction

Everybody says it: "We need more young people in ham radio." It's probably the only statement that Wayne Green and the ARRL leaders agree on. If you have "Elmered" a young ham, you know how our hobby produces inquisitive, imaginative, and ambitious youth. If you haven't, read Carole Perry WB2MGP's column each month in this magazine and you'll be convinced.

To recruit people of any age into ham radio, we need to show them that it's fun and exciting. To induce them to study for a ham ticket, we must appeal to their natural sense of adventure and competitiveness. What better ham adventure than a hidden transmitter hunt? Perhaps that's why radio direction finding (RDF) has been regularly featured in amateur radio fiction, along with T-hunts and foxhunts, as RDF contests are called.

T-Hunting Hooked Me

At age 10 I liked electronics and shortwave listening, but I knew little about amateur radio. One day I found *SOS At Midnight,* by Walker Tompkins K6ATX, in the school library. By the time I finished reading its 150 pages of suspense and intrigue involving high school hams, I knew I had to get my ham radio license.

In the same library, I found Tompkins' second ham radio novel, *CQ Ghost Ship.* In it, principal character Tommy Rockford K6ATX and a new Novice make an amazing discovery on a Saturday morning hidden transmitter hunt in southwest Washington state. That was enough to make me start badgering the leaders of my local radio club to schedule a 10 meter T-hunt. I just had to try RDF!

Stories such as these and the "Carl and Jerry" series in *Popular Electronics* magazine started me in ham radio. They fueled my imagination for new gadgets and encouraged me to learn more about radio and electronics, which led to a career as an engineer.

Tompkins, a prolific writer of westerns and screenplays, produced three ham radio novels in the 1960s, aimed at teenage and pre-teen boys. After a 20-year hiatus, he came back to ham radio as a subject and wrote three more Tommy Rockford novels in the four years before his death in November 1988. He is missed, but others have taken up his effort to promote ham radio through adventure stories.

Today's best-known ham radio novelist is Cynthia Wall KA7ITT. She writes from a much different perspective than Tompkins. Unlike the athletic, technically-inclined Tommy Rockford, who seemingly spent 24 hours a day being a ham, Cindy's lead character is Kim Stafford KA7SJP, a teenage girl for whom ham radio is just one part of a well-rounded life.

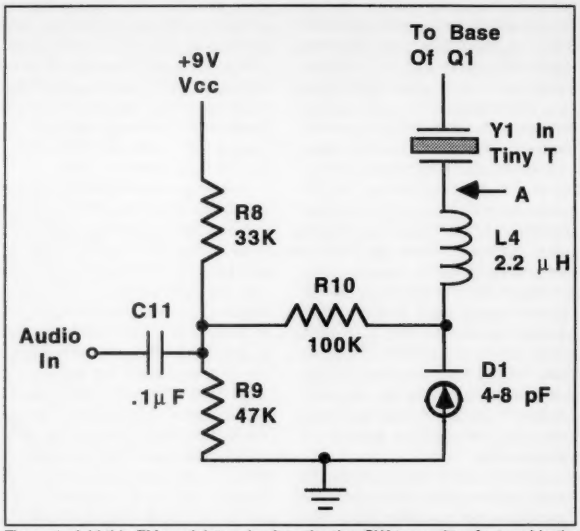

Figure 1. Add this FM modulator circuit to the tiny CW transmitter featured in the "Homing In" column for May 1993 to adapt it to your favorite foxbox.

You would expect that such a heroine would appeal primarily to girls Kim's age and younger. Indeed, that was Cindy's intended audience, but her stories have much wider appeal. Several adult male hams have told me that once started, they had to stay up into the wee hours to finish reading Wall's books.

With careful research and attention to details, Cindy has produced three ham radio thrillers so far. *Night Signals,* her first book, is the only one that includes RDF. Published in 1990, it tells how Kim and ham radio come to the aid of her new friend Marc Lawrence KA7ITR when he is injured on a solo hiking trip high in the Cascades.

Cindy's newest novel, just off the presses, is *Firewatch!* It's about Kim's summer job as a fire lookout on a remote mountaintop. But my favorite is her second book, *Hostage In The Woods.* If you read Chapter 3 and the "Author's Note," you'll see why.

The Foxhunt Adventure

Newest on the ham radio fiction scene is Dave Casler KEØOG, author of *The Foxhunt Adventure.* TFA was released by MFJ Publishing in July 1992. Written with young readers in mind, it is a story of four youths attending high school and working in a pizza parlor in Louisville, Colorado, a town near Boulder. Illegal drugs are appearing on the campus, and Ben Thompson KEØOG hears something very unusual in his hamshack that might help identify the source.

The next few days are filled with danger and intrigue. Ben and his pizzeria coworkers learn important lessons about ham radio technology and human interaction. One begins working toward her ham radio license. Her interest in improving her German by talking to DL hams and her attraction to Ben give her a dual incentive to study. Later, her budding knowledge of CW becomes vitally important as the story unfolds.

Author Dave Casler learned about radio in his childhood when his aunt gave him a Hallicrafters shortwave receiver. This interest led him to serve as an electronic systems officer in the US Air Force, and to get an advanced degree in electrical engineering. Today he is an engineer in aerospace.

"Like you, I got into ham radio because of the Walker Tompkins books," he told me. "I always wanted to do something similar to that, but never thought I could until I saw Cynthia Wall's first book. I read that and said `Gee, I can do this.' And I put an

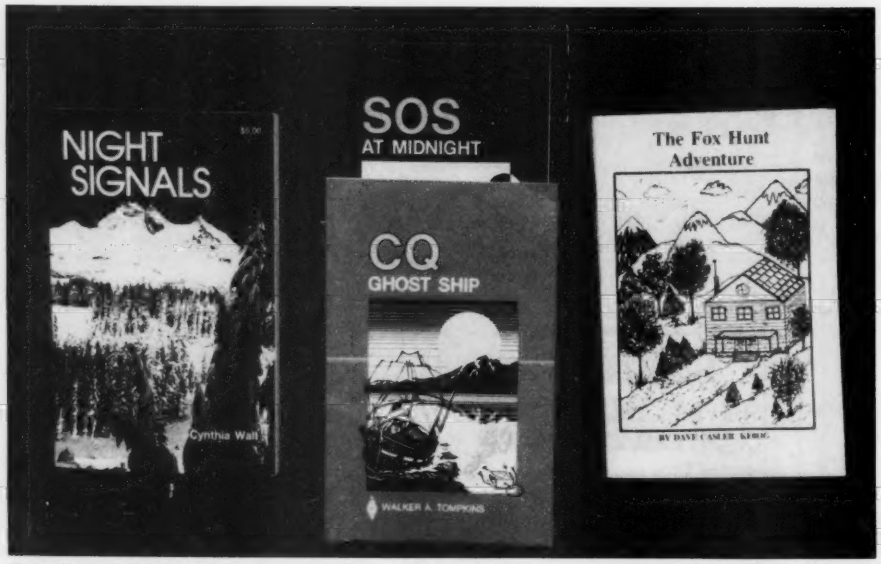

Photo A. Hams and future hams of any age will learn about our hobby and be entertained by ham radio fiction. These four books include RDF in their plots.

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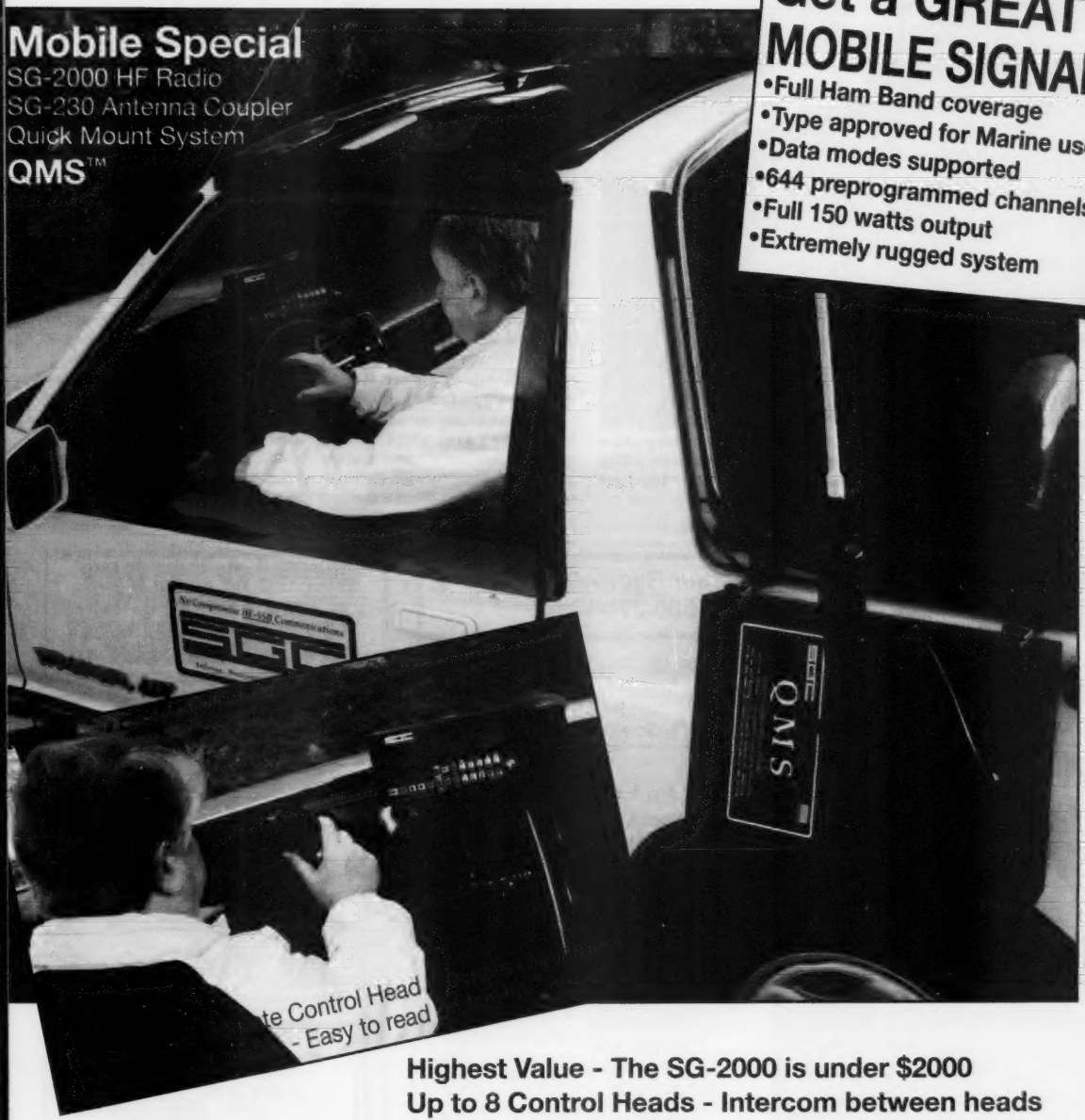

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Photo B. 16-year-old Jason McLaughlin KD6ICZ loves everything about ham radio, but his favorite activity is T-hunting. Why not introduce a young person to ham radio by inviting him or her to ride with you on your next hunt?

outline together."

The best writing, whether fiction or nonfiction, is done by people with firsthand knowledge of their subjects. Dave is well prepared to write a book that includes data encryption, bicycling, and T-hunting. "Cryptography has been an interest of mine," he said. "I wouldn't really call it a hobby, but I am a member of the American Cryptogram Association. I guess it was my exposure to codes in the military that intrigued me."

Writers develop their own favorite ways of clearing their minds, forcing concentration, and releasing creativity. "At the time that I wrote *TFA*, I was an avid bicycle rider," says Casler. "I would go on a long bicycle ride and think through a chapter, then come home and write it down."

Casler drew on his T-hunting experiences at Brigham Young University to complete his tale of high school ham adventure. "I'd been interested in ham radio for years, but it wasn't until I was in college that I did something about it," he says. "The club I was in had a lot of T-hunts. We thoroughly enjoyed them. I thought they were the greatest thing.

"We'd gather together on Saturday for the hunts. They would be on 2 meter simplex. We'd limit ourselves geographically. They weren't like some of the modern T-hunts that are truly grueling events. The fox had to stay stationary and didn't have to transmit a whole lot. Everybody constructed five-element beams out of the *Handbook* to hang out the side of the car and hold up on a stick. I didn't have one, so I'd be either the driver or the navigator on a team. We'd drive all over town and take bearings based the on S-meter. The first team to find it won."

Young readers will have no trouble identifying with lead character Ben Thompson. "I tried deliberately to make Ben a decent, fairly responsible, but in most respects ordinary person," says KEØOG. "He's vulnerable, not always as responsible as he could be. His buddy Josh Adams NØMUX is much the same."

Early in the story, Ben meets Toby, a new student from Los Angeles who seems hard to get to know. Ben wonders if he can be trusted. "Toby took over the book," Dave admits. "I hadn't intended for him to be that prominent. I became fascinated by this fellow." Readers will be, too.

"Stealth" Publisher?

The Tompkins and Wall books are readily available from ham radio dealers and by direct mail from the ARRL (see Photo A). Cindy Wall often goes to ham conventions and is invited to give talks in Oregon

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schools about ham radio and writing.

On the other hand, Casler's book is not being promoted by its publisher. You probably can't find it in ham stores. Fortunately, I noticed it in a *73 Amateur Radio Today* ad for MFJ publications via mail order. You can order it by calling (800) 647-1800. Stock number is MFJ-3101.

When I asked if Ben Thompson might have more adventures in his future, Dave said, "Writing the book was a blast. I've thought about sequels. I've got two plots already worked out in my mind, using the same characters."

I hope MFJ soon realizes what an asset they have in KEØOG and his book. It needs lots more publicity. I also hope that more elementary and secondary educators can be made aware of the value of ham radio fiction. All of the Tompkins, Wall, and Casler titles deserve prominent display in school libraries across the country. (Right, Carole?)

So if it's time to get a birthday present for a grandchild, niece, nephew, or any other young person who should learn more about ham radio, consider one or more of these fine books. But be sure to do your shopping early, so you'll have them in time to read yourself!

Next time a young person shows interest in your ham radio activities, be sure to take time to give him or her some "show and tell." And when your club puts on a T-hunt, invite a youngster along (Photo B).

Tones for the Tiny T

Last month I reported that Ken Bauer KB6TTS was adding FM to his subminiature CW transmitter for 2 or 1-1/4 meters, described in May's "Homing In." Ken's modulator has been successfully tested and it works perfectly with the Communications Specialists ID-8, reviewed last month. The entire hidden T, including the 9-volt battery, fits inside a small pill bottle or . . . well . . . use your imagination.

"Next time a young person shows interest in your ham radio activities, be sure to take time to give him or her some 'show and tell.' "

Figure 1 is the schematic for the added circuitry. D1 is a varactor diode, Motorola part number MMBV809L. It changes capacitance as a function of the reverse voltage applied to it. This varies the frequency of the oscillator, resulting in FM. D1 connects through L4 to the crystal lead that was grounded in the original circuit (Point A).

The modulator circuit loads the oscillator, so order your crystal about 2 kHz higher than your intended output frequency. DC bias on D1, supplied by resistive divider R8/R9, fine-tunes the carrier frequency. Values given for these resistors are to be used as a starting point. Change them as necessary to put your T exactly on channel. As the battery voltage decays, some frequency change will occur, but it is not great enough to warrant a voltage regulator.

Most foxbox and IDer boards include keying circuits, so U1, Q3, R5, R6, R7, and C8 in the CW transmitter are not needed. Deleting them frees up about a third of the board space, giving plenty of places to tack down the modulator components. Connect the top side of R8 to the point marked Vcc on the original schematic. Vcc also ties to the positive battery terminal. The circuit ground of the tiny T goes to the NPN keying transistor of your foxbox or IDer (gray lead of the ID-8).

Surface mount components are best, although you can squeeze 1/8-watt resistors into some locations. Newark Electronics carries the varactor diode. All other parts are available from Digi-Key Corporation. Boards and completed units are available from KB6TTS. For prices and availability, send a self-addressed stamped envelope to Ken at 2306 Turquoise Circle, Chino Hills CA 91709.

In addition to the ID-8, suitable tone and ID sources featured in previous columns include RaCon (July 1993) and TBOX (October 1991). Approximately 2 volts peak-to-peak audio is required for +/- 4 kHz deviation. Foxboxes are designed to drive microphone inputs of HTs and mobile rigs, so they include one or more dropping resistors in series with the audio level potentiometer (R9 and R10 in TBOX, for instance). Short these resistors or replace them with lower values to raise the audio voltage output.

Set FM deviation with the audio pot on the tone/ID source. A deviation limiter circuit is not included because foxboxes have constant output level. However, you may need to add a high frequency rolloff capacitor across R9 to round off square wave foxbox tones.

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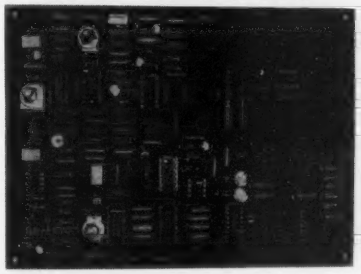

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Ocean Challenge Follow-Up

This column deals with one of the best follow-up activities we've ever had in our ham radio class. When my 6th, 7th, and 8th grade ham radio students were selected to get involved with the Ocean Challenge project ("Hams With Class," June 1993) we had no idea what a fantastic fun learning experience it was going to be.

Bill Biewenga and Rich Wilson WA1BZE set a new sailing record on April 7, 1993, from San Francisco to Boston, around legendary Cape Horn, aboard their 53-foot trimaran *Great American II*. Today in Boston, 69 days 19 hours out of San Francisco, the *Great American II* lies quietly between the New England Aquarium and Long Wharf, at a clipper ship terminal from the 1850s.

This incredible voyage was of special interest to us since my students were able to make actual contact with Rich via ham radio. The youngsters were positively mesmerized by his accounts of dolphin and whale sightings. You could hear a pin drop in our room as Rich described the flying fish that hit him in the face when he lowered himself overboard to remove some kelp from the hull. We were well organized by the second contact, with children at the wall map recording longitude and latitude readings, as the others stood by patiently with their prepared questions.

Rich explained to my kids that their dream was twofold: offshore, to challenge themselves in their chosen arena against the best; and onshore, to share their adventures en route with students and their families. As promised, it was arranged for Rich to meet with my ham radio students at the New York City South Street Seaport on June 10, 1993.

I am totally amazed at the amount of enthusiasm this trip generated in my school (Intermediate School 72 in Staten Island, New York). The 12 youngsters who actually contacted Rich were the first ones invited to meet him. I then ran several contests amongst my students to determine who else would be lucky enough to accompany us to the Seaport. The kids really went wild, bringing in all kinds of nautical and marine projects and reports.

On June 10th, 32 children and three parents accompanied me to meet with Rich Wilson in person. There was a canopy set up on board the *Peking* ship docked at Pier 17 in the Seaport in lower Manhattan. The weather was magnificent as we all proudly boarded the ship to have our much-anticipated live interview with someone who had just been a voice on the radio. The TV cameras were there, which added to the excitement.

The children sat on the deck in front of Rich as he enthusiastically conjured up the most wonderful images of his voyage for them. One child asked about the most beautiful sight Rich had seen. The response was that it was a hard choice, but that he had truly been in awe at seeing a full double rainbow off the coast of Brazil. He also surprised the kids by telling them that he and Biewenga ate like pigs and kings in order to keep up their energy level. They consumed an average of 3,000 to 4,000 calories a day. They had lots of canned fruits and vegetables, and drank soy milk.

Photo A. Carole and the kids at the South Street Seaport in front of the Peking.

There were lots of questions about the relationship between the two crewmen. Rich explained that though they were best friends, they still had arguments. Living in a 12-foot-by-12-foot cabin, they learned to sacrifice their own egos for the team goal.

The children, of course, wanted to know about the scary things. Rich assured them that there were plenty of scary experiences. He said it both scared and fascinated him to think of the ocean beneath him being 13,000 feet deep. Many things amazed him, like the interconnection of things in nature. Sand from the Sahara desert was found on their sails over 2,000 miles away.

The thing they both missed most was the contact with their families and friends. The first thing they did when they got back to Boston after their 15,300-mile voyage was to go out with family and friends for a big spaghetti dinner.

Of course, what made the children smile ear-to-ear was when Rich told them how very much it meant to him to speak with them on the ham radio. He said he took great heart in hearing firsthand how we were all rooting him on. His parting words to the kids at the Seaport were, "Keep dreaming your own dreams, and the day will come for you to go and live them."

There's no doubt that—thanks to ham radio—we were able to share in an extraordinary piece of history that we'll always remember. 73

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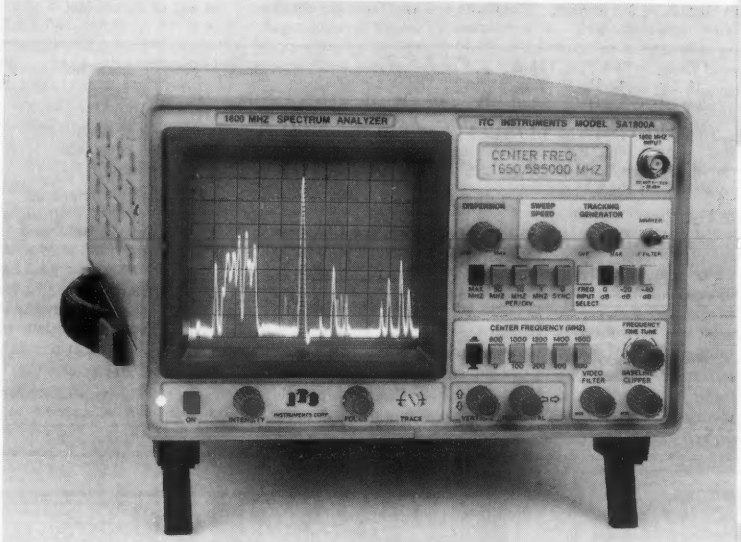

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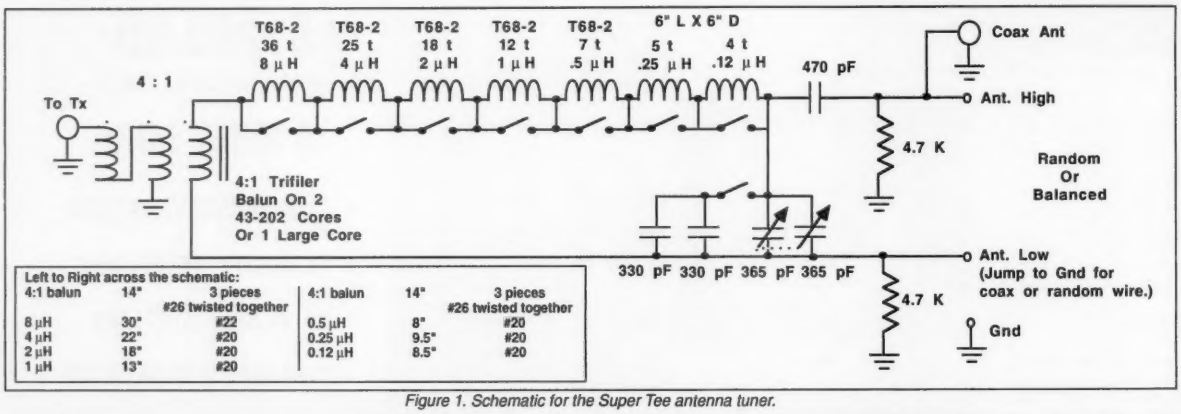
Imagine you're taking a solo trip to Hawaii in your Cessna 150. During your travels, you end up having engine trouble over the South Pole. Making an emergency landing, you prepare to walk out. All of a sudden the storm of the century starts a blowin', glaciers are cracking, bronchitic sea gulls are coughing up green ice cubes. The blizzard's so strong you're being lashed by unsecured penguins. Just when you can't take any more, a giant crevasse opens up before you. Suddenly, a yeti lays his paw on your shoulder as your left leg drops off from frostbite. At this moment, don't you wish you'd brought along your HW-8 and a small antenna tuner? A random wire fastened to a stack of frozen penguins would be great while you pound away on your straight key for help inside your snow cave. Low power is always better than no power.

But what about the antenna tuner? You can't get too much inside a Cessna 150, so you had better make it a bantam-size tuner. But, you want one that will match coax as well as random wires and oh yes, don't forget about balanced lines, too.

Well, I may have exactly what you need. It's a Super Tee tuner designed by D. A. "Mike" Michaels W3TS, and it first appeared in the June 1992 *QRP Quarterly*. Mike based his design on the original work done by DJ2LR, published in the December 1974 issue of *QST*.

Getting the Parts

The best part of all is that Kanga US has a complete kit ready to go. As with all the kits by Kanga, you get a baggie full of parts. Of course, the box to hold it in is up to you. Bill Kelsey was kind enough to let me have one of these kits at this year's Dayton Hamvention. The kit comes with all the inductors required, as well as several feet of wire of differ-



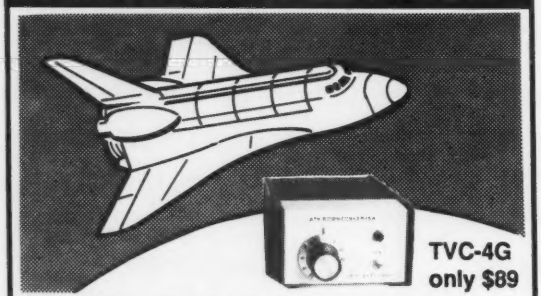
Left to Right across the schematic:

4:1 balun	14"	3 pieces #26 twisted together
8 µH	30"	#22
4 µH	22"	#20
2 µH	18"	#20
1 µH	13"	#20

4:1 balun	14"	3 pieces #26 twisted together
0.5 µH	8"	#20
0.25 µH	9.5"	#20
0.12 µH	8.5"	#20

Figure 1. Schematic for the Super Tee antenna tuner.

AMATEUR TELEVISION



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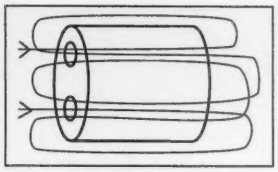

Figure 2. Winding for the trifilar balun. The solid line represents the three wires twisted together. Use an ohmmeter or continuity tester to be sure you have the right end of each winding when you solder it into the circuit.

ent gauge. Also included is the variable capacitor (always a hard-to-get part), and the two-hole balun cores, also hard-to-find. Even SO-239 antenna connectors come with the kit (surprise!). The Kanga Super Tee antenna tuner is $20 plus $3.50 shipping from Kanga US, Bill Kelsey, 3521 Spring Lake Drive, Findlay OH 45840.

How It Works

The tuner operates as a low-pass circuit and does not have any false modes that present high circulating current.

Seven slide switches and seven separate inductors are used to get a wide range of inductance while keeping the "Q" high. By using separate inductors that are shorted out by the switches when not needed, the shorted turn effect (which would lower the Q) is avoided. This means all of your hard-fought-for QRP RF is going to the antenna and not into the tuner.

One of the improvements Mike made is raising the low side of the tuner above ground. This allows the tuner to be used with a balanced line.

Putting It Together

As with just about all Kanga kits, the instructions are very thin. In fact, with this kit they're almost transparent! Even though this is not a hard-to-build kit, it might be more than the first-time builder can swallow. Not that the kit contains zillions of parts but, as with all antenna tuners, most of the work is metal forming and mechanical assembly. Without a ready-to-use box, the builder has to install seven slide switches, and that's not an easy task. Slide switches are a pain in the butt to mount on a panel.

There is no PC board to stuff. All the parts go in as point-to-point wiring. A pictorial would have really been nice to see, but alas, there is none. There is a large pictorial for winding one of the balun coils. This coil could be a source of real hair-pulling frustration without the drawing.

All of the coils mount to the back of the seven slide switches. You have to wind several toroids for this project, too. The instructions give information on winding the cores. There is a list showing you what length of what size wire to make each coil. Looking over the instructions, I came across some text telling me some of the coils come pre-wound but may have too many turns on them. So, just remove what you don't need and use the core. It would have been a good idea to mark what pre-wound core was what. I don't know about you, but I can't tell what the core type is by looking at it. Looking back, I wonder what would have happened if I just used the pre-wound cores without removing the extra turns? More inductance, yes; a screwed up Super Tee tuner, more than likely not.

The Variable Capacitor

The twin-ganged variable capacitor must be isolated from ground. How to do this is up to you. Several ideas are presented in the instructions to head you in the right direction. In the olden days, an insulated shaft coupling would be easy to come by; today, it's a different matter altogether.

I used a hunk of Teflon to mount my capacitor. Plastic stock would work just as well, as would a piece of sealed wood. A small length of a Bic Stick (the pen) makes a very good insulated shaft to connect to the capacitor. I happen to have a panel bearing in my junk box, so I did not have to worry about the case eating up the plastic shaft. An old pot (a 1957 version—not the ones used today) may be used for a panel bearing—sometimes. No matter how you do it, you must insulate the capacitor before the tuner will work. That includes both the rotor and the stator!

On the Air with the Super Tee

All you have to do to operate this tuner is to select the proper combination of inductance and capacitance, just like a regular tuner. But, instead of flipping through a range of inductance via a multi-tapped switch or roller inductor, you have to flip the slide switches on and off, selecting or de-selecting the inductance.

You do this by fully meshing the variable capacitor (max capacitance) and leaving open the switch to the extra 660 pF. Next, adjust the slide switches for a noise peak in the receiver. Peak for best noise with the variable capacitor, keeping it toward maximum capacitance. Finally, apply RF to the tuner and adjust the inductance and capacitance for the best match. By going for the noise peak first you should be fairly close to the final adjustment.

I'm not sure about flipping the switches on and off with RF applied, even with QRP power levels involved. To be honest, I've never been one to trust slide switches to begin with.

All in all, the Super Tee antenna tuner works quite well. Depending on how you end up building it, you'll find room for one in your Cessna 150. Of course, it will be up to you to find out if you can even stack frozen penguins before you start running wires to the tuner. 73

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Inexpensive 900 MHz System

Last month we described the Fort Wayne, Indiana, crossband ATV repeater. In order to avoid many of the problems which can arise when building an in-band ATV repeater, the Fort Wayne group chose to put their output on the 900 MHz band. The 900 MHz band was chosen over the 1200 MHz band because inexpensive downconverters from a wireless video system called the Gemini Rabbit were readily available at many stores at a very reasonable price (usually under $50 for both a transmitter and a receiver, complete with cables, power supplies and an A/B switch). In fact, a number of stores sell just the receiver by itself at a substantial savings.

However, as with any bargain, there is a catch. These little black boxes (see Photo A) come with built-in whip antennas that need to be removed and replaced by connectors. Jim Pliett K9OMA of the Fort Wayne group would like to share some of his modifications that allow these units to perform well for amateur TV use.

Modifying the Rabbit

To add an antenna connector to the Rabbit receiver, you must first remove the metal cover directly over the area where the whip antenna is located (see Photo B). You'll need a large soldering iron (100 watts or more) to remove this cover. You can also use a small pencil torch which can be obtained in most discount tool stores for around $5 or so.

Once you have the cover off, unsolder the capacitor which is hooked to the whip antenna. Using a pair of pliers and a screwdriver, remove the two small screws and nuts holding the whip to the backplane. You will have to determine the type of connector you want to install on the back of the Rabbit's case (usually a female BNC or F-connector). In any case, try to find a connector that threads from the rear. It's much easier to install when you can insert the connector from the outside (with the nut on the inside).

Once the connector is installed, just solder the capacitor to the connector's center pin, resolder the lid back on and you're ready to receive. Follow the same procedure to install a connector on the Rabbit transmitter (see Photo C).

Photo A. The Gemini Rabbit wireless video system consists of a tunable TV transmitter and receiver that operates on the 900 MHz band. (Photo by Jim Pliett K9OMA.)

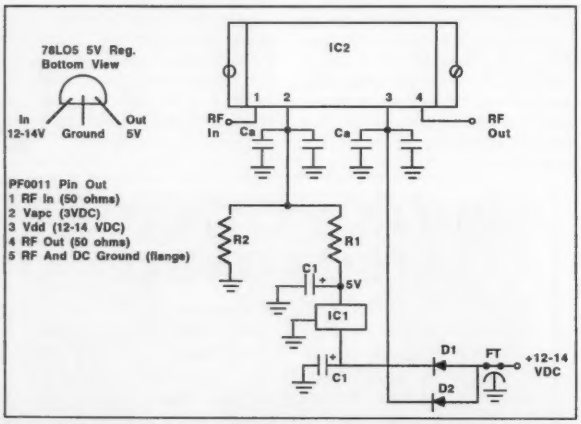

Figure 1. The output power of the Rabbit transmitter can be increased to over 5 watts through the addition of this Hitachi PF0011 linear hybrid MOSFET amplifier module. (Drawing courtesy of Bill Olson W3HQT of Down East Microwave.)

Tune-Up

The receiver has a tuning control that covers most of the 900 MHz band. Once it's hooked up to an external antenna it appears quite sensitive when tuning in the ATV repeater. With the small size and shielding, it may even work well as an antenna-mounted downconverter if the tuning control lines are "remoted" (thereby eliminating most of the coax loss).

After you remove the lid of the transmitter unit you'll find a small potentiometer near the whip antenna. Adjustments to this pot will vary your output power from around -2 dBm to about +6 dBM (about 4 milliwatts). Although this is certainly not a real powerhouse, it does transmit an excellent quality picture and subcarrier audio. Since it is not crystal-controlled, it may drift in frequency somewhat, so try to readjust the transmitter frequency control whenever the drift becomes too much.

For those of you who want some real power on the 900 MHz band, there is an easy way to up the Rabbit's output to over 5 watts.

High-Power Rabbit

Bill Olson W3HQT of Down East Microwave offers a linear hybrid MOSFET amplifier module (902-928 MHz frequency range) that should take the low power (4 milliwatt) signal from the Rabbit transmitter and bring it up to over 5 watts (see Figure 1). In contrast to many power modules that were originally designed for the cellular telephone service, this Hitachi brick is very linear (perfect for AM-

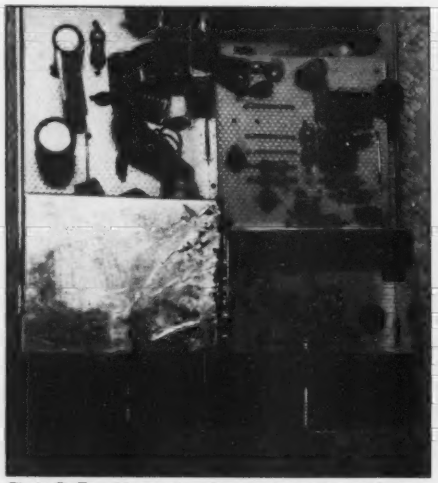

Photo B. To add an external connector to the receiver, remove the shield cover as shown. (Photo by Jim Pliett K9OMA.)

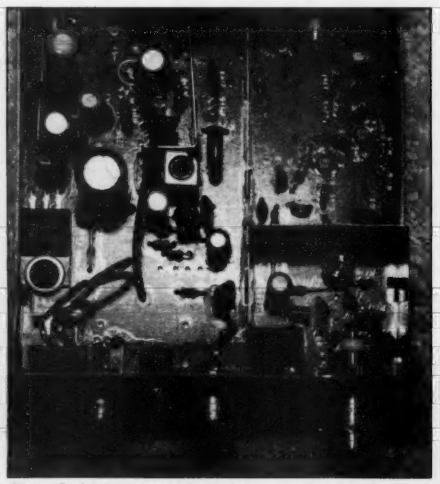

Photo C. Adding an external antenna connector to the transmitter. (Photo by Jim Pliett K9OMA.)

modulated amateur TV). It runs off of 12 VDC and draws about 2.5 amps at full output power (approximately 10 watts) when driven with 10 milliwatts.

You should mount the Hitachi power module onto a heat sink (use a layer of thermal compound for efficient heat transfer). Be careful not to overtighten the mounting screws or you could crack the module's substrate. The output gain is adjustable from 30 to 50 dB with an external control voltage (3 volts nominal); however, the 30 dB gain setting offers the best linearity. Each of the two voltage inputs needs to be bypassed to ground through parallel capacitors, as shown in Figure 1.

Down East Microwave (Box 2310, RR1, Troy ME 04987; telephone: (207) 948-3741) offers the PF0011 module for $65 + $3.50 s/h, and a blank PC board that can be used with the module for $8. They also have a complete kit which includes the PC board and all components for $95 (model #3310PAK).

This linear amplifier is easy to build and mates well with the power level of the Rabbit transmitter. It is also a good choice for any transmitter circuit you may want to amplify (as long as you don't exceed 10 milliwatts into the brick).

I hope that the easy availability of the units described in this column helps spur some more activity on the 900 MHz band. Even though we are sharing the band with an ever increasing quantity of consumer and commercial users, it's still a very effective band for ATV.

Thanks to Jim Pliett K9OMA and Bill Olson W3HQT for the information presented this month. 73

Parts List

IC1	78L05 +5V 200 mA 3 term. voltage regulator
IC2	Hitachi SC1043 hybrid module
C1	3.3 µF 16V tantalum electrolytic
Ca	0.1 µF and 0.001 µF chip capacitors in parallel
R1	240 ohm 1/4W carbon film resistor
R2AA	470 ohm 1/4W carbon film resistor
FT	Feed-through cap
D1,D2	IN4004 diodes

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10 GHz Operations Wideband FM and SSB

I have been asked numerous questions concerning 10 GHz operations, questions about everything from simple, easy-to-build systems to the more complex methods. The easiest to build and least expensive are the wideband FM systems. The least expensive types of these often use converted burglar intrusion alarms. At the other extreme are the SSB rigs that require expensive microwave hardware.

There are advantages to each mode. The primary difference depends on your luck finding equipment at a reasonable cost. In the case of the wideband, there are several outlets from which useful hardware can be obtained. These include many of the commercial burglar alarm companies that are replacing microwave units with newer devices. Check with your local alarm company to see if they will part with any of these gems for little or nothing. They operate on 10.525 GHz, and can be moved down to 10.250 GHz by a simple screw adjustment.

If you are unable to locate surplus units, one alternative would be to buy from a vendor like SHF Microwave Supply, 7102 W 500 S. La Porte IN 46350. They stock both new and used units ranging in price from $20 (for used) to $65 (for new varactor-controlled units). These were not intended for communication purposes but they adapt quite nicely.

Varactor vs. Non-Varactor Systems

Having a varactor frequency control system is just like having a variable capacitor in the circuit for frequency adjustment. Usually, capacitance is adjusted by varying the control voltage from zero volts to +10 volts. (The Gunn diode is held constant at 10 volts). Diodes that work in this voltage range are best. They will give you about 60 MHz of frequency adjustment. This best case scenario is achieved using the very fine MA-COM GUNNPLEXER—the standard for excellence.

By comparison, the unit with varactor control available from SHF gives about 15 MHz of frequency control. The varactor makes the tuning operation quite easy compared to a non-varactor-controlled system.

In a non-varactor-controlled system, tuning is achieved by varying the frequency adjustment screw to the exact frequency you desire, just like with varactor units. You need to use a frequency meter or wavemeter. This adjustment is made with the Gunn voltage (normally +10 volts) set to about 9 volts. Then, after you have calibrated the set screw frequency adjustment, you can vary the Gunn voltage up and down from about 8 to 10 volts for a fine frequency adjust control. As the voltage nears 8 volts, some diodes will drop out of oscillation. This voltage limit varies among Gunn diodes. You will have to find the adjustment and voltage range to suit your system. The range depends on cavity adjustment and so many other factors that I simply can't list them all here.

Here's an easy method to remember: Find the lowest voltage your unit will work at reliably. Set the mechanical adjustment screw to approximately mid-range with respect to frequency difference. Remember, frequency is not always linear and may be more affected at one end of the voltage range than the other end. Usually frequency changes more at the high end of the adjustment. I have observed about 5 MHz of adjustment using this method of voltage tuning on a typical 10 to 50 mW Gunn diode system.

The premium units to use are varactor-controlled systems, those with both a Gunn diode and a varactor diode in the oscillator cavity. They are the easiest units on which to set frequency—and they make wideband operation quite easy compared to the burglar alarm units. The key difference is cost, from about $20 for a burglar alarm unit to something closer to $250 for a MA-COMM GUNNPLEXER cavity. For a cost somewhere in between you can home-brew a Gunn cavity with some brass waveguide and a lot of patience.

I have had Gunn diodes available for several years, including both 50 and 100 mW devices. The high power devices are finally all gone but a few 50 mW devices remain. I am still searching for a batch of varactors to facilitate new cavity construction. Varactors have been quite scarce on the surplus market, halting home construction projects in this area. Recently I obtained a small quantity of varactors and they did not test out to be wideband devices. I realized only about a 5 to 10 MHz frequency adjustment range—disappointing, but they worked. I will continue to keep my eye out for more suitable parts. I haven't spent too much time trying to pur-

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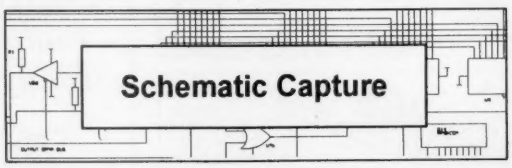

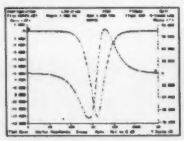
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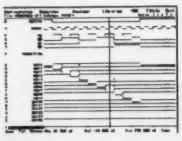
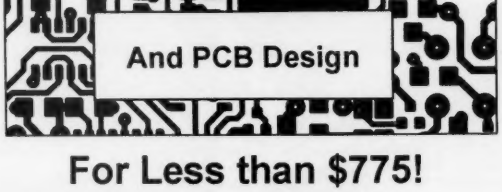

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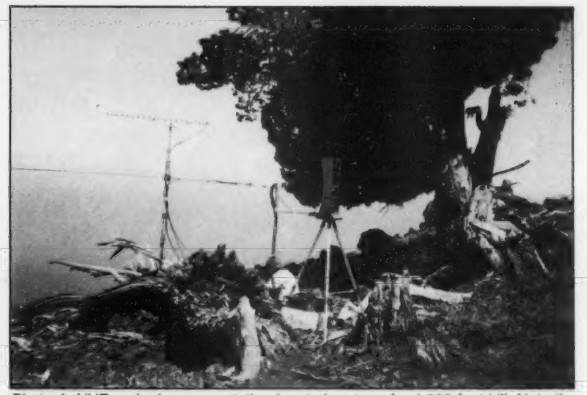

Photo A. VHF and microwave station located on top of a 4,000 foot hill. Note the home-brew wooden dish used by N6XQ.

chase the components new, as I am trying to put together a "bargain basement" unit for wideband FM.

10 GHz SSB Operations

Operation on SSB—compared to wideband FM—demands a totally different type and complexity of circuitry. You could use these units for wideband FM but there is no reasonable benefit. The SSB systems will support narrowband FM just as easily as SSB and the improvements are remarkable, partly due to reduced bandwidth and frequency stability. Any time you decrease the signal bandwidth you obtain a marked increase in distance and apparent power capabilities. For instance, take a 10 mW wideband unit and a 100 microwatt SSB system for comparison. On a path of about 150 miles during one of the the ARRL 10 GHz contests, we were unable to make contact with wideband FM using a 20 or so inch dish for the wideband FM system. With dish gain of about 25 to 30 dB, plus the 10 mW power input, we produced output power (ERP) of about 1 watt.

Now, for comparison, the SSB system was a basic brick oscillator (with high frequency stability) and a mixer driven by a 2 meter FM handie-talkie for the IF system. This combination of components produced about 100 microwatts of power at 10 GHz. The antenna used was a 15 dB horn, and a reliable readable contact was easily made over this same 150-mile path. This narrowband system was operating at a fraction of comparative power output and some 15 dB difference in antenna gain, but the lower power and system gain still made the contact. The prime difference? Higher frequency stability was a factor, to be sure, but the most important factor was reducing the bandwidth from 75 kHz or so to 5 kHz deviation. A further improvement could have been made with SSB compared to narrowband FM, had SSB gear been available on this borrowed 10 GHz system.

Improved SSB stations usually do not operate on that low a power level, but great results can occasionally be found. Higher power stations may include TWT amplifiers (10 watts power output) feeding a 30-inch dish with some 35 dB gain, making a very formidable system. Lower power stations with solid-state amplifiers like the ones discussed last month are also used for power output in the 1/4 to 2 watt range. A 1/4W amplifier conversion from surplus material was also discussed in this column in the September 1992 issue of *73*.

High power and frequency stability alone do not make a station-other equipment is required. Each added component adds to system cost. You need to add mixers, microwave relay switching, receiver low noise preamplifiers, and still package this in something other than a 50 caliber ammo can. (Although I still use ammo cans when I can find them.) Cost-wise, a typical 10 watt TWT amplifier in working condition is priced at about $200. The mixers can cost upwards of several hundred dollars for new commercial jobs, but surplus units can be obtained for about $50. The microwave relays of the SPDT variety (four required for full switching applications) cost about $30 each. The receive low noise preamp costs about $80 for a home-brew unit.

The local oscillator can usually be found in one of two forms. One is a home-brew, similar to one recently described in *QST* by Zac Lau. This unit consisted of a crystal oscillator multiplier that used several GaAsFETs for microwave multiplication to the required injection frequency. The other popular form of device is the famous "brick" oscillator that appears from time to time in surplus. Zac designed his home-brew unit because of the low availability of brick type oscillators. I have to admire his well-thought-out design. I haven't priced out his compo-

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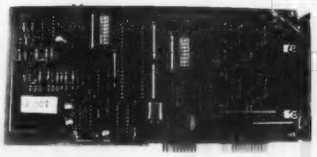

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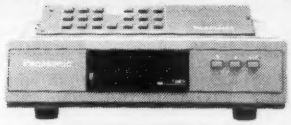

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nents, but I figure they cost around $100, using a good junk box to hold cost down. That is competitive with the brick systems which cost $50 each and require that an additional $20 oven-controlled crystal be ordered from International Crystal for phase-lock operation. Again, this is just a price comparison of different systems.

The cost breakdown on the receive low noise preamp is as follows for a two-stage GaAsFET amplifier, with 18 dB gain and Nf of about 2.5 dB: SMA coaxial connectors (female chassis mount) $8, two MGF1402 FETs $30, PC board w/chip res-caps $20. Add some flashing copper for a box or container to house the amp and add the bias power supply and you add another $10 to $15 dollars to the amp's cost. Of course, this price can be greatly reduced by raiding a well-stocked junk box.

Well that's the overview on operation and system costs. There are many advantages and disadvantages to each and every system, not withstanding cost. These truths are not going to change. Narrowband operation methods far out-work wideband systems. Wideband systems are the least expensive. Crystal multiplier systems *can* have frequency accuracy problems, and that includes brick oscillators. But, if you can obtain a brick at a good price don't bother building your local oscillator. It's a lot easier to use a brick than to build one.

Now, please be advised that I am biased towards the brick system and I use it extensively. I have invested lots of time in them and would rather fight than switch. Of course, what you do will depend on what you have available. I have acquired many extra bricks and will make them available to those interested, while supplies last. A 10 GHz brick is $50 postpaid US only. A reset brick, set to 10.223 GHz for low injection (filters retuned), is $65.

Please note that these units can be found at some surplus dealers for a lot less money. I have heard comments on prices ranging from $100 at Dayton to $5 from a flea market, so keep your eyes open.

Well, that's it for comparisons of different systems and components for 10 GHz. The basic mode of operation for most amateurs operating on this band is to first operate with wideband FM and then proceed to make many different modifications to their rigs, both commercial and home-brew. A natural transition to the more lucrative operation efficiency of narrowband modes is typical. During the last ARRL 10 GHz contest (September and October 1992), almost 90% of all 10 GHz contacts were made on SSB modes of operation. Wideband operation accounted for less than 10% of operation. Most of us bring out our wideband equipment but do not give it the same attention that we used to. For instance, during the first contest back in 1986, all operation, without exception, was made using simple wideband FM burglar alarm units and some commercial MA-COM units.

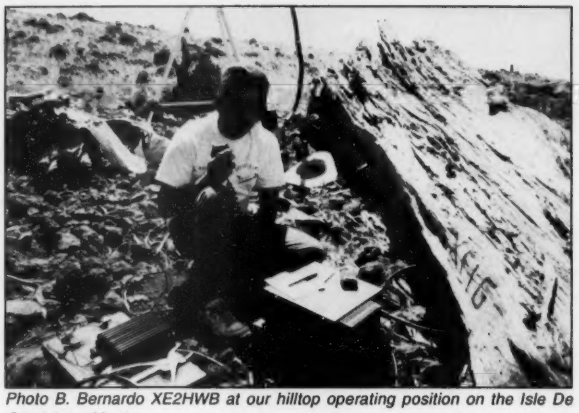

Photo B. Bernardo XE2HWB at our hilltop operating position on the Isle De Guadalupe, Mexico.

Microwave Update '93

Just a reminder that the Microwave Update '93 Conference is going to be held September 24-25 in Atlanta. Papers to be presented at the conference include 10 GHz construction, waveguide filters, 24 GHz operation, a single board 1296 transceiver, radio astronomy, computer aided design, and microwave basics. This, as always, is expected to be a great program of microwave and VHF-UHF expertise. If you can go, you should. For details, contact conference chairman Jim Davey WA8NLC at 4664 Jefferson Township Place, Marietta GA 30066; (404) 998-6971.

Recent Activities

One of the more active members of our San Diego Microwave Group recently took part in a DXpedition to the Isla de Guadalupe "XF1G." This island

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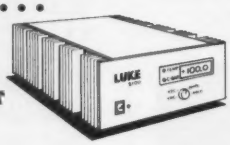

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is owned by Mexico and is located in the Pacific Ocean 155 miles west of Baja California and 350 miles south of Los Angeles. The 29th parallel bisects the island, placing it in grid locations DL08 and DL09. The main inhabitants of the island are thousands of chivos (goats). Human inhabitants reside on the southern half of the island and number around 50. They are primarily seasonal abalone and lobster fisherman, their families, and members of a small Mexican military detachment.

The main thrust of the expedition was to activate the island for the RSGB-managed "Islands on the Air" (IOTA) program. The special IOTA designator for Guadalupe is NA-179. Participants were Jose Luis Ogawa XE2TT, Eusebil Morales XE2EAA, Felix Numez XE2JNE, Bernardo Gonzalez XE2HWB (Photo B) and Jack Henry N6XQ. This is Jack Henry's account of that adventure:

Jose Luis did much of the planning, which involved negotiations with the Secretariat De Marine for prepositioning heavy and bulky items on the island. The generator, gasoline, antennas, tents, masts, beverages, etc. were transported by Naval frigate and stored at the island's marine base prior to our arrival.

At 1000 PDST on 14 May 1993, we departed Ensenada airport in a twin-engine Cessna. The flight was uneventful and in about an hour we were circling the fishcamp. The flyover is the signal for the fisherman to load abalone and proceed to the landing strip which is about an hour's drive. After landing on the 6,000-foot runway, we had plenty of time to unload, take pictures and relax. Sure enough, about an hour later, a 1960 Jeep 1-1/4-ton truck appeared with what seemed to be about half of the fishcamp piled in back. The pilot placed a large tarp in the aisle of the aircraft and the fisherman transferred in more abalone than I had ever seen in my life. At about 1900 PDST all of the predeployed equipment, along with the gear we flew in with, was loaded into the truck and a small cargo trailer. The bumpy ride to the north yielded breathtaking views of the rolling volcanic hills, shear drops to the ocean and an occasional sighting of a chivo herd.

Dusk signaled the arrival at our operating camp. We were in a little valley at the edge of a large forest of tall juniper and cypress trees. We immediately set up camp and erected a tribander. The first HF QSOs were made around midnight. HF conditions during the expedition were fair to very good.

Bernardo and I were the VHF operators for the expedition. The bands we operated were 6, 2, 223.5 MHz, 432, 1296 and 10 GHz. The first VHF QSO with the special call XF1G was with W6OYJ in San Diego at 1550 on 15 May. Signals were good, but not super strong from this location, due to the rolling hills to the north of us. Morning and midday propagation were much better than the evening. We operated the VHF station on Saturday and Sunday from this site and moved the station to a 4,000-foot peak on Monday primarily to work 1296 and 10 GHz. The location was super. Phil W6HCC was setting his 10 GHz station in the San Bernardo mountains about 375 miles away. His signal on 10 GHz was S9 +40 dB. Subsequent 10 GHz contacts were made with N6CA, WA6CWM, WA6EXV, WA6CGR and WA6CDR. All were S9 +++ at distances better than 350 miles. W6HCC returned to his home QTH in Cherry Valley and bounced off the mountains to the north to work us with 5X5 peaks.

The best DX on 2 meters was with Dave WA6CGR, who was operating portable at Point Reyes, north of San Francisco, 700 miles distant. Dave was running 10 watts into a four-element yagi. Dave drove from Los Angeles primarily to attempt a 10 GHz North American record shot. There was high probability we would have made it if we had been at the higher location when Dave was there. (Dave was not available for the Monday attempt.)

All in all, there were 12 QSOs on 6 meters, 57 on 2 meters, one on 223, 17 on 432, six on 1296, and 10 on 10 GHz. Jack stated that if they had been able to operate on the mountain peak all three days, QSO totals would have tripled. Tuesday morning we packed up all the gear and headed for the fishcamp, where we would stay and wait for the flyover the next day for the return trip to Ensenada. The hospitality of the fisherman and their families was excellent. We slept in a one-room schoolhouse and our diet until the return was carne de chivo, frijoles, and tortillas. The fishcamp had a pet chivo called "Chivo Loco" because it was mean and crazy. It would sneak up, chase, and try to butt members of our party with its long horns. We wondered how it escaped the dinner table.

The return flight was in a slightly larger plane and again uneventful. As an American, it was a real pleasure to work with the Mexican hams and be part of their culture for a week. They were most gracious and I was happy for the opportunity to participate in their DXpedition—de Jack N6XQ.

Well, that's it for this month. Next month I will describe a complete 10 GHz QRP SSB rig. As always, I will be glad to answer questions concerning this topic or other related VHF microwave material. Please send an SASE for prompt reply. 73 Chuck WB6IGP.

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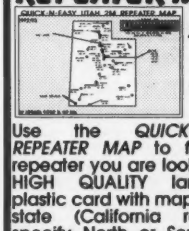
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Your Tech Answer Man

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Mobile Operations

It's lots of fun to sit in front of a desk with a radio and talk around the world. It's also fun to yack with the locals on the neighborhood repeater from the comfort of your home. But America is a very mobile nation; the average driver goes between twelve and fifteen thousand miles a year! That's a lot of time spent in the car. And let's not forget all the other kinds of travel, including airplane, bus, train, bicycle and good ol' shoeleather. This month, let's take a look at installing and operating portable and mobile gear.

In the Pocket

There aren't too many hams who don't have walkies. At least, it sure looks that way at hamfests, where seemingly everybody has an HT attached to his or her body. HTs, which normally cover VHF and UHF, are lots of fun. There's no installation required; you just turn the radio on and go. If you're walking around town, an HT lets you stay in touch with friends. If you have autopatch privileges, it can be awfully handy to make phone calls home or to a friend's house, as long as you remember to observe the rule prohibiting business communications. Oh well, you'll still need a real phone to order that pizza!

My primary concern regarding walkies is over the energy my head is absorbing from that rubber duck antenna two inches from my eyeballs. Although there's lots of controversy about it, the government has established safety guidelines for close-up RF exposure. 2.5-watt 2 meter rigs don't appear to pose significant danger, but I'd avoid using more power than that. Let's face it, even if you go to 5 watts, the difference of 3 dB at the receiving end is minimal, so why risk it? Besides, the high power output kills your battery a lot faster.

Another way you can help yourself remain safe is to limit your transmission time. RF exposure damage occurs over a period of time, and is measured with regard to the *average* total power absorbed, not the peak power. So, if you're putting out, say, 2 watts, but only transmitting a quarter of the time, that's the same as putting out 0.5 watts continuously. Let's face it, most hams are too darned long-winded anyway! Listening more and talking less could only do most of us good.

Auto Mobile

If you use your walkie in the car, you will quickly find that the rubber duck antenna works very poorly when enclosed in such a metal cage. Unless you're close to the repeater, you're going to get lots of complaints from other hams that you're scratchy or dropping out. Reception probably will be noisy, too. With a rooftop antenna, though, it's a different story. Your range will increase dramatically. Also, you're pretty well protected by the metal roof and the increased antenna-to-body distance, so why not have all the power you can? Most of today's walkies put out between 5 and 7 watts when run on 13.8 volt car power. Be careful, though, because they get awfully hot while transmitting and can actually damage your car's upholstery (or your hand). It seems reasonable to assume the high heat reduces the overall lifespan of the radio, too. To avoid it, just don't transmit for long periods of time.

Many hams do, in fact, use their walkies in their cars, mostly to avoid the expense of another radio. It makes sense, with today's mobile rigs selling for between $300 and $600. If you've ever tried it, though, you know that using your walkie in the car has some drawbacks. First of all, there's the low audio output. Most modern walkies are rather small, and their 200 mW outputs and tiny speakers were never meant to be heard over the noise of an automobile. Also, many HTs' speakers are rated for less power than their audio amps actually put out! Under normal circumstances it's no problem because you don't listen to it at maximum volume anyway. But in the car, it's easy to turn it all the way up and leave it there. Sometimes, the result is a blown speaker and a trip to the repair center. And, oh yeah, a bill.

Pump It Up

Is there a way out? Sure. What you need is a separate amplifier and speaker. A bigger speaker alone probably won't do you much good because the rig's little internal amplifier just isn't likely to have the power to drive it. In fact, some speakers, particularly those intended for music reproduction, are exceptionally inefficient and can actually sound *softer* than the little one in the radio! So, an amp is called for here.

You can build one easily enough; many amplifier designs have been

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published right here in *73* magazine. If you're not so inclined, you can buy one, too. But why bother? There's an easier, cheaper way: Use your car stereo! If you have a cassette player, you can use one of those cassette adapters intended for portable CD players by plugging it into your rig's earphone jack. Just cut off the adapter's plug (which is stereo) and replace it with a mono plug, connecting the wires for the two channels in parallel. Or, use a stereo-to-mono plug adapter. You probably will have to turn your walkie's volume down quite low, and you may find that there's too much background hiss, or that you can't get the volume down low enough. In those cases, put a resistor in series with the hot lead. I haven't tried this, but I'd imagine that 100 ohms to 1k ought to do it. Experiment with it until you find a resistor value that allows you to set your walkie's volume about a third of the way up. Then, adjust your listening volume with the stereo's volume control. If you don't have a cassette player but do have an FM radio, they make adapters which actually are little transmitters you tune in on your car radio. They should work fine, too.

It's an Intermod World

Using a walkie in the car, you may run into a more serious problem than puny audio. You may find that your receiver gets trashed pretty badly in certain parts of town. If you live in a large city, you're almost certain to run into this problem. We live in an RF-saturated society, and most areas have lots of paging transmitters and public-service towers and such, emitting plenty of power 24 hours a day. Unfortunately, walkies' front ends are very small, and there just isn't room for big filters. Also, today's units (with the exception of the Radio Shack HTX-202) permit reception over 20 or 30 MHz, requiring wideband front ends anyway. Some HTs use voltage-tracking front-end filters driven by the microprocessor to track the tuned frequency, and that does help, but some don't employ such techniques. Finally, walkies are primarily designed for receiver sensitivity because they are intended to be used with those little rubber dummy loads. Intermod rejection must, by necessity, take a back seat.

Is there a way out? If you're sufficiently knowledgeable to build your own bandpass filter, that will go a long way toward reducing the garbage. Of course, you'll have to give up public-service-band reception. Another way out would be to design an automatic antenna switch which selects the roof antenna for transmitting and an indoor duck for receiving. As I mentioned before, reception with an indoor duck can be poor, but sometimes it actually works better than what you get with an overloaded receiver. I remember once, in Miami, having the repeater disappear altogether, only to get it back once I switched to the rubber duck. It was a classic case of front-end overload.

The Juice

Oh yeah, I almost forgot—you're gonna need to power your walkie, too. Sure, you can use the batteries, but why use them up when your car can power the rig? Besides, as I mentioned before, you'll get both more transmit RF and more audio output on 13.8 volts. To properly operate your radio, the DC power supplied to it needs to be clean. Clean power in a car? Forget it! All car power is loaded with alternator spikes, ignition noise, you name it. Also, the voltage can go up and down, sometimes by up to 2 volts, as you drive faster and slower. Yuck! Many walkies have direct DC input jacks, suggesting that you can simply plug them into your cigarette lighter and talk away. You probably can, but you'd be wise to take a voltmeter and check the voltage of your car's electrical system first. If it's over 15 volts with the engine going fast, you've got a regulator problem and you can save yourself a radio repair bill by straightening it out before you plug the rig in. Also, if your car radio or stereo has lots of alternator whine (distinguished by its being audible when the volume is turned all the way down), don't plug the HT in. Alternator whine consists of fast spikes which can be several volts or more. They are too fast to affect voltmeter readings, but they sure can ruin a radio. I've seen electrolytic capacitors, RF power output modules, and especially audio amplifier ICs ruined by prolonged operation on such spiky power. Fix the car first.

Some cars are very electrically noisy, but are not actually broken in any way; they're just made that way. If yours is like that, consider a power filter. Some rigs offer them as options. Or, you can buy a generic choke and capacitor-type filter at Radio Shack or an automotive sound-system dealer. You only need something under 2 amps, so a small one should be fine. Just be careful to connect it *after* a fuse, or you could be headed for real trouble. A friend of mine forgot to do that and suffered $400 worth of damage to his car, including a blown alternator, when the filter shorted to ground. A 50-cent fuse would have prevented the whole thing. Heck, you don't even have to add your own fuse; just connect your DC lead to the fused side of your stereo's power line.

Well, there's lots more to talk about, including mobile VHF/UHF rigs and, of course, the ultimate mobile operation: HF. Until next time, 73 de KB1UM.

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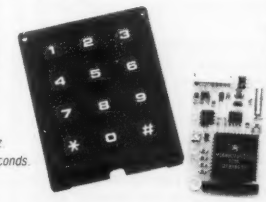

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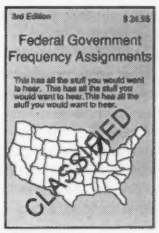

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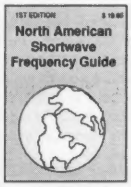

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CIRCLE 276 ON READER SERVICE CARD

Arnie Johnson N1BAC
43 Old Homestead Hwy.
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Notes from FN42

Ahhhh! Another Field Day has been completed and a "good time was had by all!" As we were setting up a tower with a tribander on top, vertical antenna, wire antennas, VHF/UHF antennas, and satellite antennas, I was wondering why we go to all the trouble of setting it all up when in just a few hours (24 or so) we will be taking it all down again. But, after the first contact was made, that question seemed to answer itself. It's fun! Hopefully WS1A was heard and contacted by some of you. If not, well, there's always next year, and we are already critiquing this year's operation and making plans for next year.

A short FAX from David Horsfall, Hambassador to Australia, says that he has been very busy but will have some news for us next month.

Pay close attention to a packet message from Monk Apollo SV2ASP, Mount Athos. He provides us with the "real story."

Now, on to the news from around the world. 73, Arnie N1BAC.

Roundup

Ecuador Stuffed in the mailbox this past month was a copy of the program notes from radio station HCJB, Voice of the Andes. Since I know that some of you are also SWLers, you can also receive the same program schedules by writing: HCJB, Casilla 17-17-691, Quito, Ecuador, South America, and please tell them that *73 Amateur Radio Today* sent you.

Israel *Downloaded from packet originated by N1BEE @ KA1AZ as AMSAT News Service Bulletin 163.01:* The Israel Polytechnical Institute will launch its first satellite, known as the Guerwin-1, from the Baikonur space port in Kazakhistan, aboard a Russian rocket. Professor Guiora Shaviv, Director of the Space Research Department of the Institute said that the satellite will weigh about 60 kg. and will carry a packet radio Bulletin Board System (BBS) for amateur radio operations. This project involves the participation of 12 different Israeli companies. This satellite from "Technion," as the Polytechnical Institute is known throughout the world, was a project which began three years ago and will be placed in orbit as a secondary payload, along with a Russian satellite and another German satellite.

Please stay tuned for the AMSAT News Service bulletins for further details concerning the launch of this new amateur radio satellite.

The following report is from Arnold Samuels KH6COY: I must say that my last trip to Israel was FANTASTIC! I made contact with a group of hams in Natanya through Haim 4X6ZI. On very short notice, he called the hamdom of Natanya and the following hams showed up at a very pleasant meeting in the Hotel Goldar: Paul Gross 4X4UU; Haim 4X6ZI; Micha Klein 4Z4KM; Avner Hirschfeld 4Z4NH; Hayim Dentes 4X4DJ; Jose Cohen LU1HGA; Israel Berko 4X1OM; Haim Ken-tor (waiting for call letters).

They were really very hospitable and very enthusiastic to talk to an American ham. The group was eager to talk about ham radio in America and, since the Israeli license structure is patterned after ours, they also wonder if we are going in the right direction. It was a great experience to stand on 10,000 years of civilization. *[Arnold Samuels KH6COY, 431 Bass Ave., Ocean Shores WA 98569]*

Mt. Athos *Downloaded from packet by Ron Gang 4X1MK, and sent to 73, originated by SV2ASP:*

Greetings to all of you, DX friends all over the world.

I feel the need to communicate with you and to give you the real reasons, officially, why Mt. Athos is no longer heard on the air and when will it will finally do so, because many rumors circulate and many things are written without containing a grain of truth.

I stopped broadcasting 15 months ago from Mt. Athos, because the ARRL has officially recognized the illegal broadcasts of the German ham Drobnica Baldur DJ6SI. I have in my hands all the legal documents which prove the fraud, and those recognizing the illegal broadcasts of the said ham.

This fact has caused a lot of upheaval here on Mt. Athos, as well as disgust, because it is against the articles of the Charter on the basis of which the Monastic Community is governed, and which has been respected for over 1,000 years, and which (Charter) has been respected by all, even the most cruel invaders.

The ARRL's taking this particular attitude allows—on purpose—time to go by and considers it a given fact. ARRL members spread the rumors that they will have Mount Athos removed from the DXCC countries list because it is no longer available on the air.

Dear Sirs: Mt. Athos is ready and waiting for the ARRL to live up to its responsibility and rise above interests and ulterior motives and cancel the illegal broadcasts of DJ6SI, so that Mt. Athos will be once again heard on the air.

Other rumors circulating about Mt. Athos going on the air again are totally misleading. They aim at placating the decent hams of the world who justifiably wish to establish contacts with Mt. Athos, the sole—on a worldwide scale—Monastic Christian Center with its rich history and its current growing presence, so they can acquire its coveted QSL.

I truly regret, dear friends, the way things have developed, but as a rationalist Orthodox Monk living here on Mount Athos, this locus of prayer and meditation, I cannot accept what has happened and what the ARRL continues to embrace with its official support.

I have faith in God that soon the correct solution will be provided by the ARRL and that this way I will once again join you on the air.

I send you my best wishes from Mount Athos.

God Bless You. Apollo, Monk, SV2ASP @ SV2DXC.TSL.GRC.EU. *[Monk Apollo, Dochariou Monastery, Mount Athos, GR-63087 Greece.]*

Russia *Downloaded from packet originated by Andy RW3AH:* Only quite recently packet radio received a legal status in this country. But still we enjoy no expected "Big Bang" growth of this kind of communication. Yes, those who had a strong desire and could find money to buy themselves decent equipment are now already gaining their won experience. For the last three years, however, the number of packet radio stations increased very insignificantly, to say nothing of BBSs. This situation is certainly due to the general stagnation in our economy, though there is some light at the end of the tunnel.

At the end of 1992, Russian Amateur Radio Emergency Service (RARES) began developing a new local VHF packet channel on 144.650 MHz. The development of packet radio is going so fast that the brightest idea of amateurs is to set up a global packet radio network. TRANSPAK was started! Many organizational problems were overcome along the way. In a short span of time, we did as much as we could have done in the previous five years or longer. On May 4, 1993, we effected the first packet radio connection between Moscow (RW3AH) and New York (WA2NDV). Now we have a link with the American continent and Europe operating 24 hours a day!

This experimental link operates at 300 and 1200 baud (AX25). Today, we are able to communicate in real time with nearly all the continents. Constant forwarding with the U.S. is going fine.

We wish to express our special thanks to Frank WA2NDV without whose help and cooperation this project would probably still be on paper and not on the air. We also thank N2MH, WN9T, NT2X, RV6HY, and the teams at UZ3AWO and R3ARES club stations. *[Andy (RW3AH/WL7AP) @ R3ARES. #MOS.RUS.EU.]*

Switzerland *News taken from the International Telecommunication Union Press releases:* Working Party 8A, chaired by O. Villanyi of Hungary, met in Tokyo, 13-22 January 1993, and approved six new draft recommendations on: cordless telecommunication systems; personal radio systems and digital short-range radio; future amateur radio systems, disaster communications in the amateur services; use of amateur services in developing countries; and frequency-sharing criteria in the amateur services. *[No mention was made of what the recommendations said.—Arnie]*

Future meetings known to include amateur radio working groups are: Study Group 8 on 26 October and 21-25 March 1994 in Geneva for mobile, radiodetermination, amateur and related satellites services; Working Party 8A 27 October to 5 November in Geneva covering land mobile service, excluding FPLMTS; amateur and amateur satellite services.

Task Group 8/2, chaired by P.L. Rinaldo (USA), met in Boulder, Colorado, 19-23 April 1993, and was attended by participants from various fields. They reached a common understanding about the situation of wind profiler radars and other services which might have interferences to or from the wind profiler radars. The meeting produced the following results: one preliminary draft on technical and operational characteristics; four preliminary draft elements of the report to the Radio Communication Conference concerning general subject matters and candidate bands around 50 MHz, 400 MHz, and 1 GHz.

The Africa TELECOM 94 Exhibition and Forum will be held in Cairo, Egypt, from 25 to 29 April 1994. The Forum will be held under the theme: "Integrating Africa Regionally and Globally—A Challenge for Telecommunications and Development." For further information contact: Mr. Tom Dahl-Hansen, Executive Director, TELECOM, or Ms. Suzan Hee-Sook Lee, Project Manager, Africa TELECOM 94, ITU, Place des Nations, CH-1211 Geneva 20, Switzerland.

HONG KONG

Phil Weaver VS6CT
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Hong Kong

As with everything else in Hong Kong, it can take an awful long time to get things done when it comes to recreational activity, as business always takes the front running when it comes to people's time, and as a result many of the planned improvements to amateur radio in Hong Kong, such as an extra repeater, renewal and installation of new beacons, packet cluster for ELARCS, and many other interesting projects which your committees are trying to implement, are slowly progressing. As most of you know, ELARCS has at last got its cluster up and running on 144.500 MHz, and we hope to shortly have a node up with the repeater so that the coverage can be improved and perhaps even get into Macau. Other improvements are in the pipeline, and we hope that 1993 will see many of these completed.

One of the topics currently being discussed by the H.F. Committee of the Radio Society of Great Britain (RSGB) is the question of access to the HF bands (below 30 MHz) without the necessity of a Morse qualification. Such a license would be referred to as a "code-free license." The RSGB tells us that amateur radio is controlled internationally by the regulations set by the International Telecommunication Union (ITU), which is an agency of the United Nations. They add that the current ITU regulations require that radio amateurs operating at frequencies below 30 MHz demonstrate their proficiency at sending and receiving Morse code, though the speed and nature of any test is not specified. The RSGB wishes to consult as widely as possible and seeks input on the question of a code-free license from any radio amateur or listener, whether they are for or against the idea of such a license. You should send your views, opinions and comments to: The HF Committee, c/o RSGB HQ, Lambda House, Cranborne Road, Potters BAr, Herts. EN63JE, United Kingdom. Letters should be clearly marked "Code-Free License" on the bottom left-hand corner of the envelope. Since Hong Kong is still a territory under the jurisdiction of the U.K. on international matters, at least until 1997, amateur radio here basically still follows their lead.

Finally, I would like to extend an open invitation to any of our readers that if they are interested in a visit to the Maritime Rescue Coordination Centre located on the roof of the Rumsey Street Car Park Building in Sheung Wan to see the investment that the Hong Kong Government has made in the field of Communications associated with the implementation of the Global Maritime Distress and Safety System, they will be made very welcome. Please call Phil Weaver on 543 5558 during office hours to make an appointment.

Regards and 73 from "China Town."

MONACO

Daniel Plett 3A2LZ
B.P. 349
MC 98007
Monaco

Monaco hams quite often get asked the same questions from many U.S. hams. Here are some of the questions and how we'd respond.

1. Are there many active hams in Monaco? There are about 50 licensed hams with about 12 of them being fairly active on an international scale.

2. Is anyone active on CW, RTTY, AMTOR, packet, SSTV, etc.? One Monaco ham, by himself, does about 1,500 QSOs a year, mostly on CW, and most others do at least some. There are three or four equipped for RTTY but only one active right now. No one is currently active on AMTOR or packet. There are a few equipped for SSTV, but no one is regularly active.

3. What about a DXpedition? There is no problem getting a reciprocal permit. The big problem is finding a place to operate. Monaco is extremely small and crowded and doesn't have much space for portable operation. Only one or two of the most expensive hotels allow antennas and radio activity. Many visiting hams in the past have abused their privileges, broken laws, and invoked the ill will of local hams. Most portable/mobile operations from Monaco end up being illegal one way or the other, and their contacts cannot be counted for DXCC credit.

4. How about a sked? Most Monaco hams are quite pleased to work U.S. hams, but don't usually make skeds. There are three main hindrances. The surrounding mountains have at least a 30 degree elevation, making low-angle radiation difficult. Most of us are limited to multiband vertical antennas. The 100 watt power limit makes it difficult to be heard through the rest of Europe. Here are two hints: 1) Think about local times. Most of us are working folks who have to keep somewhat civil hours. 2) Try long-path. Some U.S. hams check in quite easily to European DX nets this way and we do have low-angle radiation to the U.S. via long-path.

That's all for this time. If any of you have more questions, other than what I have covered, please contact me at my address, or pass the question to Arnie at *73* and he will get it to me. 73 to all. 73

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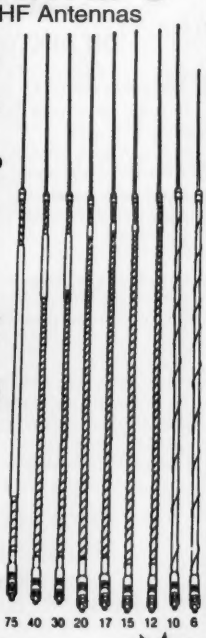

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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

SEPT 5

BURLINGTON, IA The Iowa-Illinois ARC Inc. will host "Burlington Hamfest '93" from 7:30 AM-3 PM, at the Iowa Army Nat'l. Guard Armory, Summer St. Rd. (across from Burlington Municipal Airport). VE Exams. Talk-in on 146.790/.190 W0LAC/R, and 146.520 simplex. Get details from *Chuck Gysi N2DUP, Burlington Hamfest '93, P.O. Box 911, Burlington IA 52601-0911. Tel. (319) 752-3000.*

SEPT 9-12

FORT MONMOUTH, NJ Members of the WW II Electronic Training Group will be holding a four-day reunion. Details are available from *Harrison W. Moore, Jr., COL SIG C (Ret), 260 Millard Ave., No. Tarrytown NY 10591. Tel. (914) 631-3683.*

SEPT 11

BALLSTON SPA, NY Saratoga County R.A.C.E.S. Assn., Inc. will hold "Hamfest 93" at the County Fairgrounds from 7 AM-3 PM. Talk-in on 146.40/147.00 and 147.84/.24 WA2UMX/R. Contact *N2FEP, P.O. Box 41, Rock City Falls NY 12863.*

ERIE, PA The Radio Assn. of Erie will sponsor "Erie Hamfest '93" at the Franklin TWP Fire Hall, from 8 AM-2 PM. VE Exams at 9 AM at Franklin Center Methodist Church, Rt. 98 (1 mile north of Hamfest). Talk-in on 146.01/.61. Contact *Erie Hamfest '93, Tom McClain N3HPR, 3954 Solar Dr., Erie PA 16506. Tel. (814) 833-1640.*

HARMONY, NJ the "Flemington Fallfest" will be held by the Cherryville Repeater Assn. from 8 AM-2 PM at the Warren County Fair Grounds, Route 519. VE Exams. Talk-in on 147.375+ and 146.820-. Contact *Keith Burt KF5FK, P.O. Box 308, Quakertown NJ 08868-0308. Tel. (908) 788-4080.*

CHANUTE, KS Chanute Area ARC will sponsor a Hamfest at North Malcolm Community Center from 8 AM-3 PM. Contact *Jon Wood W0UHL, RR2 Box 163A, Chanute KS 66720.*

SEPT 12

FINDLAY, OH This year the Findlay RC is having its 51st annual Hamfest at the Hancock County Fairgrounds, East Sandusky at Fishlock. Talk-in on 147.15+ mc rptr. Call *(419) 423-1440* for details.

JOLIET, IL The Bolingbrook ARS will hold its 8th annual Hamfest/Computer Fair at Inwood Rec. Center, 3000 W. Jefferson St. (Rt. 52), beginning at 8 AM. VE Exams for all classes, from 9 AM to Noon. Table Reservations: *Ed Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517. Tel. (708) 985-0527.* For more info, call *(708) 739-9309.*

MONETT, MO The Ozarks ARS will hold its annual Picnic and Swapfest from 8 AM-2 PM at the Monett City Park, located at the intersection of Hwys. 39 and 60. Talk-in on 146.97- and 146.52. Contact *Gary Meyers, 1201 S. Madison, Aurora MO 65605. Tel. (417) 678-3376.*

OLD WESTBURY, NY The Long Island Mobile ARC will sponsor a Hamfest at the New York Institute of Technology, Route 25A, from 9 AM-4 PM. Talk-in on 146.25/.85 Contact *Neil Hartman WE2V, (516) 462-5549.*

SOUTH DARTMOUTH, MA The South Eastern Mass ARA will hold their 6th annual Hamfest & Flea Market from 8 AM-3 PM at the Club grounds at 54 Donald St. Talk-in on 147.00/.60. Contact *Michael Enos, P.O. Box 79064, North Dartmouth MA 02747.*

SEPT 17-19

VENTURA, CA The American Radio Relay League Southwestern Div. Convention Keynote Address (The Search for Extra Terrestrial Intelligence: or, Chasing the BIG DX) will be given by Dr. D. Kent Cullers WA6TWX, at the Ventura Holiday Inn, as a part of "HamVenture '93." For more details write to *HAMVENTURE '93, P.O. Box 3000-267, Santa Barbara CA 93130.*

SEPT 18

BERWICK, PA A Hamfest/Computerfest will be held, starting at 8 AM, at the Beach Haven Carnival grounds by the Columbia Montour ARC. VE Exams at 1 PM (by advanced registration only). Talk-in on 147.225 (+600) or 146.52 simplex. For info, reservations, call *Dave WC3A at 717-752-6851.*

GLORIETA, NM The Northern New Mexico ARC invites you to attend their annual Hamfest which will be held in the Aspen Bldg. from 8:30 AM-4 PM at the Glorieta Baptist Conf. Center. Talk-in on 146.52 simplex, 145.19- or 147.30+. ARRL VE Exams for all classes; to register contact *Bonnie Griffiths KD0JQ, 190 Manhattan Loop, Los Alamos NM 87544. Tel. (505) 662-9155.* Flea Market contact: *Helenrose Burke W5IXS, P.O. Box 73, Ojo Sarco NM 87550.*

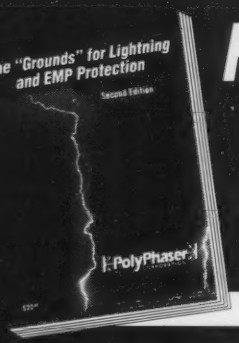
GONZALES, LA The 1st annual "Gonzales Hamfest 93" will be held at Gonzales Rec. Center from 8 AM-3 PM. Sponsored by the Ascension ARC. Talk-in on 147.225+, CTCSS 107.2. Contact *Wayne Russell, 40390 Sycamore Ave., Gonzales LA 70737. Tel. (504) 622-3964.*

SEPT 18-19

PEORIA, IL The Peoria Area ARC will sponsor the 34th annual "Peoria Superfest" at Exposition Gardens, Northmoor and University Sts., beginning at 8 AM. Talk-in on 146.76/R. Contact *The Peoria Area ARC, Box 3508, Peoria IL 61612-3508. Tel. (309) 685-6698.*

SEPT 19

CAMBRIDGE, MA The MIT Electronics Research Soc., the MIT Radio Soc., and the Harvard Wireless Club, will hold a Flea Market from 9 AM-2 PM at Albany



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MT. CLEMENS, MI The 21st annual L'Anse Creuse ARC Swap and Shop will be held from 8 AM-2 PM (EDT) at L'Anse Creuse High School. VE Exams at 11 AM; contact *Don Olszewski WA8IZV, (313) 294-1567; Prodigy #SSTG41A.* Talk-in on Echo Rptr. 147.08/.68 MHz or on 146.52 MHz simplex. Flea Market contact: *Ted MacKinnon NW8W, 19534 Warick, Beverly Hills MI 48025-3970. Tel. (313) 647-1628, ((517) 595-2309 from 6/28/93 to 8/21/93). (Compuserve 71303,2244).*

SANDYHOOK, CT The Candlewood ARA will sponsor an ARRL sanctioned Hamfest at the Sandyhook Firehouse, beginning at 8 AM. Talk-in on 147.12. Contact *Candlewood ARA, P.O. Box 3441, Danbury CT 06813-3441. Tel. (203) 438-6782; (203) 792-1845; (203) 426-1652.*

SEPT 24-26

WICHITA, KS The 1993 Kansas State ARRL Hamvention will be held for 3 days at the Ramada Broadview Hotel on Douglas and Waco Sts. ARRL/VEC Exams. Saturday Banquet. Contact *Len Warren N0QHZ, 6233 Millsboro, Wichita KS 67219-1637. Tel. (316) 744-1930.*

SEPT 25

DANVILLE, VA The Danville-South Boston Hamfest will be held at the Nat'l. Guard Armory. W5YI Exams on a pre-registration basis. Get details from *Bonnie Manasco AB4KO, 2107 S. Boston Rd., Danville VA 24540. Tel. (804) 822-6070 (work); (804) 822-5345 (home).*

ELMIRA, NY The Elmira ARA will present the 18th annual Internat'l Hamfest at the Chemung County Fairgrounds, Horseheads NY, from 6 AM-5 PM. Loads of events. Talk-in on 147.96/.36 or 444.20 Rptr. Contact *Dave Lewis, RD1 Box 191, Van Etten NY 14889. Tel. (607) 589-4523.*

SEPT 25-26

YORK, PA The 38th annual York Hamfest/Computer show will be held at the York Fairground on Rt. 74, Carlisle Ave., from 8 AM-4 PM each day. Table contact: *(717) 764-4805.* Talk-in on 146.37/.97. VE Exams Sat. only, at 9 AM. For info, write to *York Hamfest, P.O. Box 351, Dover PA 17315.*

SEPT 26

ADRIAN, MI The Adrian ARC will hold their 21st annual Hamfest/Computer Show at Lenawee County Fair Grounds from 8 AM-2 PM. Walk-in VE Exams. Talk-in on 145.370. Contact *Dennis Boydston WE8Z, 2383 E. Clearview Dr., Adrian MI 49221. Tel. (517) 265-8054.*

BUTNER, NC The Falls Lake ARC will sponsor its 2nd annual Hamfest at NCNG Armory from 8 AM-4 PM. Contact *Fred KC4VSO, FLARC, P.O. Box 502, Butner NC 27509. Tel. (919) 575-4262.*

CLEVELAND, OH The Hamfest Assn. of Cleveland, Inc., will present The Cleveland Hamfest and Computer Show at the Cuyahoga County Fairgrounds, Berea OH. Doors open 8 AM-4 PM. VE Exams. Talk-in on 146.73, 6 AM-12 PM. Banquet Sat. night. Speaker TBOA. Write to *C.H.A., P.O. Box 81252, Cleveland OH 44181-0252.*

LONGMONT, CO The Boulder ARC will host its Amateur Radio Electronics/ Computer Swap Meet at the Boulder County Fairgrounds Exhibition Bldg., Nelson and Hover Rds. Doors open at 8 AM. For VE Exams/Table Spaces, call *(303) 440-3627.* Mail reservations (deadline Sept. 18th) to *BARCFEST, 726 19th St., Boulder CO 80302.* Talk-in on 146.70.

ST. PETERS, MO The 9th annual St. Peters ARC Swapfest will be held in the rear parking lot of St. Charles County Community College, from 7 AM-1 PM CST. Talk-in on 145.41 MHz and 444.275 MHz. Contact *Walt Franzer WX0C, 1333 Pegasus Trail, St. Peters MO 63376. Tel. (314) 278-1993.*

SPRINGFIELD, IL Sangamon Valley RC Hamfest will be held at Sangamon Co. Fairgrounds in New Berlin from 8 AM-1 PM. VE Exams 8 AM-9:30 AM. Statewide Packet BBS meeting at 11 AM. Talk-in on 147.315-, 224.68-. Contact *Don Pitchford WD9EBK, RR#1 Box 104, Springfield IL 62707. Tel. (217) 789-4519.*

YONKERS, NY The Giant Electronic Fleamarket, sponsord by Metro 70cm Network, will be held at Lincoln High School on Kneeland Ave. from 9 AM-3 PM, rain or shine. VE Exams. Talk-in on 440.425 MHz pl 156.7, 223.76 MHz pl 67.0, 146.91/.31 Rptr., 443.350 MHz pl 156.7. Contact *Otto Supliski WB2SLQ, (914) 969-1053.*

OCT 2-3

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL KY State Convention will be held at the Commonwealth Convention Center, downtown Louisville, Sat. 8:00-17:00, Sun. 8:00-15:00. Contact *Greater Louisville Hamfest Assn., P.O. Box 34444-S, Louisville KY 40232-4444. Tel. (502) 551-4118.*

VIRGINIA BEACH, VA The Virginia Beach Hamfest and ARRL Virginia State Convention will be held at Virginia Beach Pavillion. Commercial vendors contact *Lewis Steingold W4BLO, 3449 Dickens Dr., Virginia Beach VA 23452. Tel. (804) 486-3800.* VE Exams by the South Peninsula ARC on Oct. 3rd.; call *Ed Brummer W4RTZ, (804) 898-8031.*

OCT 3

HUNTINGTON, IN The Huntington County ARS will sponsor its 5th annual Hamfest from 8 AM-2 PM at the PAL (Police Athletic League) Club in Huntington. VE Exams. Talk-in on 146.085/.685 and 448.975/443.975. Contact *Ray Tackett KC9DZ, 420 Market St., Andrews IN 46702.*

MANSFIELD, OH The AAARC will host the North Central Ohio Hamfest from 8 AM-3 PM, at the Ashland County Fairgrounds. Talk-in on 147.105+. Contact *Wally Green W3YXS, (419) 281-3903.*

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Park, 47-01 111th St. Doors open 9 AM. Talk-in on 444.200 WB2ZZO Rptr., and 146.52 simplex. Contact (night time only) *Arnie Schiffman WB2YXB, (718) 343-0172,* or *Charles Becker WA2JUJ, (516) 694-3955.*

SPRINGFIELD, OH The Independent Radio Assn. will hold its annual Springfield Ohio Hamfest/Computer Show from 8 AM-4 PM at the Clark County Fairgrounds. Talk-in on 145.45 and 224.26 MHz. For reservations, write to *Independent Radio Assn., P.O. Box 523, Springfield OH 45501 (SASE);* or call *Carl Patterson KA8LGS, (513) 323-6680.*

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SPECIAL EVENT STATIONS

SEPT 4-14

McDERMOTT, NV The O.I.N. 3 States DX-pedition, sponsored by the Vancouver Mountain RC, will operate W7WY from the state line of Oregon, Idaho, and Nevada. Operations will be CW and phone, 160 thru 10m, 24 hrs a day in the General portion of the band; also 12, 17, and 24m. For a certificate or QSL card, send an 8" x 12" SASE to *Vancouver Mountain Radio Club, W7WY, P.O. Box 1622, Vancouver WA 98668.*

SEPT 8-16

KIOWA, KS The Salt Plains RC will operate WA0HIH/W100CS, to commemorate the 100th Anniversary of the opening of the Cherokee strip land rush into Oklahoma. Special QSL by #10 SASE. Frequencys: +/- 20 kHz, 3.900, 7.235, 14.250, 21.325 and 28.500. Contact *Kiowa Cherokee Strip Centennial, 717 Coats, Kiowa KS 67070.*

SEPT 10-12

NORWALK, CT The Greater Norwalk ARC will operate KA1OFN Sept. 10 2100Z-2100Z Sept. 12, to celebrate the 17th annual Oyster Festival and the 125th Anniversary of Sheffield Island Lighthouse. Operation will be in the lower 25 kHz of the General 80, 40, 20, and 15m phone subbands, and the Novice 10m phone subband. For a certificate, send QSL and SASE to *Greater Norwalk ARC, c/o Norwalk/Wilton Red Cross Bldg., 43 North Ave., Norwalk CT 06851.*

PORT TOWNSEND, WA Jefferson County ARC will operate at the Port Townsend Wooden Boat Festival, between 1700 UTC and 2400 UTC, on the General bands for 15 and 20m, and 28440 on 10m. The event station, W7LD, will reciprocate with an event QSL card. Send QSL and SASE to *Olly Gardner KA6OZZ, Box 65156, Port Ludlow WA 98365.* Contacts will be made with Marine Nets.

TULELAKE, CA The Keno ARC will operate Station WD6EAW at the Tulelake-Butte Valley Fair. Operation will be in the lower portion of the General bands from 1600Z-2400Z. For a special QSL card, send an SASE to *WD6EAW Special Event, P.O. Box 653, Keno OR 97627.*

SEPT 10-13

PUT-IN-BAY, OH Members of the Oliver Hazard Perry Expeditionary force will operate KB8BN to commemorate the 180th Anniversary of the "Battle of Lake Erie." Frequencies: 7.240, 14.240, 21.365, 28.365. For a certificate, send QSL and 9" x 12" SASE to *Commodore Jim Yoder KB8LDG, 11796 Shadybrook Dr. NW, Pickerington OH 43147-9122.*

HIGHLANDS, NJ The Ocean-Monmouth ARC (OMARC) will operate 1600Z Sept. 11-1600Z Sept. 12, to commemorate the Marconi Memorial Twin Lights Lighthouse Radio Site. CW - up 10 kHz from bottom of Novice subbands; 10.145, 14.045, 18.080 MHz; bottom of General 80-15; Novice 10m phone subbands. For a certificate, send 9" x 12" SASE (or $1 U.S.) to *OMARC, P.O. Box 75, Bradley Beach NJ 07720.*

SEPT 12-30

OAK RIDGE, TN The Oak Ridge ARC will sponsor a second Special Event, on all bands, to commemorate the 50th Birthday of the City of Oak Ridge, the site of the original Manhattan Project. "We were born of War, are Living for Peace and Growing through Science." A four color certificate is available. Please SASE to operators' home call.

SEPT 13-18

ATLANTIC CITY, NJ Southern Counties ARA (SCARA) will operate K2BR for 5 days, from the Miss America Pageant (Absecon Island, IOTA: NA 111). Time: Starting at 10 AM EST. Frequencies: Phone - 25 kHz inside lower General bandedge; CW - 65 kHz inside lower General bandedge; Novice - 28.100, 28.500 kHz. To QSL, send #10 SASE via *SCARA, P.O. Box 121, Linwood NJ 08221.*

SEPT 18-26

KELLEYS ISLAND, OH Members of the Massillon and Canton ARCs will help commemorate the Lake Erie Commission Coastweeks projects by operating WD8DEA/N8LCS from the Kelleys Island Scuba Shipwreck tour Sept. 19th, and the Put-in-Bay Harbor Cleanup Dive, Sept. 20th. Operations will be in the General and Novice bands with phone on 3.880, 7.280, 14.280, 21.280 and 28.380 MHz. CW - 3.685, 7.110, 21.110 and 28.100 MHz. Packet - 145.07; phone - 147.475 MHz. Send QSL and SASE c/o *Jack Wade, P.O. Box 537, Kelleys Island OH 43438.*

SEPT 24-26

PEA PATCH ISLAND, DE The Tir-County Amateur Group will operate KD3XN 1400Z-2100Z, from historic Civil War Fort Delaware. Operations will be in the General and Novice portions of 10, 12, 15, 17, 20 and 40m. For a color aerial view QSL, send QSL and SASE to operator worked.

SEPT 25-26

ECKLEY, PA The Down River ARC will operate N3JPS Sept. 25 1400Z-1800Z Sept. 26, to commemorate the 50th Anniversary of the original flag raising at Eckley Miners' Village in Luzerne County PA. Operation will be in the General subbands and in the Novice 10m subband. For a beautiful certificate, send QSL and a 9" x 12" SASE to *Rob Barnshaw N3JPS, 540 Church St., Royersford PA 19468.*

WARRENS, WI The Monroe County ARC will operate KA9ETH, 1400Z-2200Z Sept. 25; 1400Z-1900Z Sept. 26, to commemorate the 21st Annual Warren's Cranberry Festival. Frequencies: 14.270, 21.370, 28.370. For a certificate, send a QSL and a 9" x 12" SASE to *Marshall Kiel N9FVU, P.O. Box 344, Tomah WI 54660.*

OCT 2

ANAMOSA, IA The Jones County ARC will operate N0CWP 1500Z-2000Z, to celebrate their annual Pumpkinfest. Operation will be on the lower 50 kHz of the General subbands. For a certificate, send confirming QSL to *Jim McClintok N0CWP, Box 462, Morley IA 52312.*

OCT 2-3

BETHEL PARK, PA The Breezeshooters ARC will operate W3XX from the U.S.S. Requin SS481, a Tench Class WWII submarine, 1400Z-2100Z both days. Frequencies: Phone - 28.450, 21.350, 14.250, 7.250, and 146.52; CW - 28.150, 21.050, 14.050 and 7.050. For a QSL card and certificate, send 8 1/2" x 11" SASE to *Ron Berry WB3LHD, 326 Sunset Dr., Bethel Park PA 15102.*

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06S

NEVER SAY DIE

Continued from page 4

We're still the only group of communicators capable of providing dependable emergency communications. We're the only group able to help CBers, police, fire, and other fixed and mobile radio services communicate with each other.

But Not for Long

It isn't going to be long before we're going to see satellite communications making it possible for anyone to communicate with any car, truck, plane, boat or ship anywhere from Hawaii to England. I don't know how many outfits you have in your part of the country working on this technology, but we've got one in Manchester, New Hampshire, that's well along with a spread spectrum system which will let almost any number of units keep in touch. Companies will know exactly where every one of their trucks is at any moment, and will get instant word via a bar-code reader of every pickup and delivery. Your portable computers will be able to communicate with anyone anywhere via this network. Mobile units will not only provide positioning information, but will allow voice, fax, and computer communications . . . if you want.

The antennas for these little buggers are small enough to be built into car tops. And will be. Small umbrella-like antennas will allow HTs and notebook computers to join the network.

All this will probably take 10 to 20 years to become ubiquitous, but when it does why will anyone need amateur radio emergency communications? For what? Then what will be our excuse for keeping our bands?

Yes, of course I have a solution, but old-timers are going to hate it. Of course, with the average ham age in the 50s now, most of the old-timers will have been awarded their Silent Key certificates, so it's not their problem. My proposal is to get busy starting radio clubs in our schools and bring in a flood of youngsters. If we can turn amateur radio into a recruiting ground for high-tech interested youngsters we'll be worth our frequencies.

If you have the idea that the no-code license has attracted a big bunch of kids to the hobby, you are dreaming. The figures I've seen show that about 12% of our newcomers are youngsters. Back before we killed off 95% of the school radio clubs 30 years ago, 80% of all new licensees were youngsters. And 80% of them went on to high-tech careers.

If we can start attracting youngsters again we'll not only get them interested in high-tech careers, we'll start seeing some inventing and pioneering again. All of the major technical developments amateur radio has pioneered were made by relative youngsters. I know because I was there for many of them and knew the chaps involved personally. I was one of the first experimenters with narrowband FM (NBFM). Ditto SSB. Ditto RTTY. Ditto SSTV. Ditto 10 GHz. Ditto 6m. Ditto beacons. Ditto repeaters.

No, I haven't done much lately. I got all wrapped up with computers almost 20 years ago and got sidetracked. Heck, I'm still wrapped up with computers. Then I got re-involved with hi-fi audio and digital sound. So now I have one of the finest recording studios in the world.

More and more of our ham clubs are sponsoring school radio clubs. Way to go. I'd like to see more pictures I can publish. And I'd like to see more about this in the club newsletters.

It's probably getting almost time to start discussing what we think is the best kind of license exam to go with hamming in the '90s. Our exams are still hung up back in the Dark Ages. What should a youngster be able to demonstrate to us to be worthy of a license? And does the long ladder of license classes fit in with hamming the way is today?

For many years I've recommended we change to just one class of license and depend on the fun of learning and doing things to build knowledge. The current licensing system is a joke. The test questions and answers are published, so it's purely a memorization exercise and has little to do with actually learning anything. It would be nice if our ham clubs would organize technical sessions at the start of their meetings. This might help the members to understand how antennas and feedlines work. It could help them understand the basics of receivers and transmitters. And how about some tech talks on packet, RTTY, SSTV, and other ham communications modes? Is your club offering tech sessions like these? Why not? This is supposed to be a technical hobby, right?

One of my problems is that I not only recognize that change is inevitable, I actually welcome it. I enjoy change. This may have a lot to do with the host of enemies I've generated . . . and every one of which I am proud. So let's think in terms of how things are going to change and how we can best adapt to it so we'll continue to have a hobby, even under the new conditions.

2020 Vision

What will amateur radio be like in the year 2020? Or will our hobby still be around? If so, what purpose will it serve that would validate its cost to the public? And what technological developments do we see emerging which will affect our future?

One fast-emerging technology which is encroaching on our turf is the network bulletin-board systems such as CompuServe and Prodigy. These allow people to go on-line and talk with each other about any mutual self-interest. An ad in *New York* magazine for their network has an international chat line where you can talk with people all over the world one-on-one in real time about anything you want. It also allows you to get information about restaurants, movies, plays, stocks, etc., and even play chess.

There are thousands of bulletin boards. Most are dedicated to special interests, but there are a growing number of wide-interest systems and people are getting caught up in these by the hundreds of thousands. Sure, they run up telephone bills, but there's no interference, no fading out, no pile-ups . . . just solid contacts.

Well, okay, on-line services are going to do nothing but grow. We're going to need help in finding out which services provide what, how good they are, and how much they cost to use. That information will be available on-line too.

But what about when we're driving or walking? Well, driving, since we don't walk much any more except to walk or jog just for the exercise it provides. We don't want to be out of touch just because we're mobile. Our systems will have to enable us to stay in contact when we're in our cars, on planes, or at sea.

It isn't going to take 27 years for satellite communications technology to extend our telephone wires, figuratively speaking, into our cars. By 2020 our homes and offices may all be connected by fiber optic networks. Or we may have gone all satellite. I expect it'll be a combo, with satellite links used mainly to interconnect to mobile units and fiber optics for fixed.

The amount of data we'll be zipping around will be far beyond what wires or even cables can handle. TV looks as if it'll be moving from 100 channels to TV-on-demand, making it so you won't have to record the 2020 version of ``Murphy Brown'' so you can see the program when you prefer instead of when the TV network program director decides. Your TV set will be more like tapping into a humongous video rental store. You may not even have to pay for the programs if you'll put up with the automatically inserted commercials. Fast-forward through 'em and your bill goes up.

We're already starting to see the development of spread spectrum satellite communications systems which will enable every car, truck, plane, boat and ship to tie into the network. People in cars will be able to keep in touch with anyone anywhere, either by voice, voice-messaging, or a fax-like system. You'll be able to be reached, but only if you want, no matter where you are. We'll adapt to this.

Since most of my work requires privacy, I'm reachable by phone about an hour a day. I read a lot. I write a lot. Neither of these activities are compatible with answering the phone or dealing with visitors. When I write I build a general picture of what I want to cover and then start getting it into my laptop computer. If someone comes in with a question or the phone rings, pffft, the picture is gone. So I do 99% of my productive work in my office at home. I drive to my business office for an hour or two a day for meetings with the staffers, and to answer phone calls. I use the 10-minute drive to review new compact disc releases, so even my driving time is productive.

I'm in touch with the office by phone and fax, if they need me. But I try to get my people to be self-reliant. I look for people who don't need much direction. It has not been easy finding them. Our school system, as I've written, goes to lengths to stamp out the very traits I find valuable.

I've gone into some detail on this because I believe more and more people will be wanting to work as I do. The day of the home-office is coming fast. As our communications systems improve there will be less need for going to ``the office.'' We'll be able to video conference from anywhere for meetings. People wanting to talk with me will be able to find out what times are best (1000-1100 Eastern), and get through with one call. Even my production crew will be able to put together magazine pages remotely. From anywhere.

So where does amateur radio fit in when anyone will be able to talk with anyone anywhere in the world at will . . . and at a reasonable cost? When we have world on-line services where people interested in Italian Greyhounds can easily find and talk with each other, complete with video? When Gilbert & Sullivan fans can sing in groups, even when one is on a boat in California and another is driving in Maine?

We may even find people going to weird places to cater to a 2020 version of DXCC for people who are collecting the places they've talked with. Will there be pile-ups for some idiot fighting the tide on Minerva Reef? Computerized systems will allow tens of thousands of contacts per minute, so maybe not.

We do know one thing for sure. The communications systems of 2020 are going to require quite a bit of spectrum, even with spread spectrum systems, so we'll be losing our microwave channels before long. We've never used 'em anyway, so it won't seem like a big loss . . . at the time. They were a hold-over from the early experimental radio days that we will only appreciate after they're gone.

A few of us old-timers can still remember the stink when we lost the 7,300-8,000 kHz band and there was talk of the League having sold us out. The sudden building of expensive houses by several League officials didn't tend to quiet the rumors of a pay-off for the loss of frequencies.

With the need for short-wave commercial communications eliminated by satellite and fiber optic systems, we may be able to not just hold on to our low bands . . . we may be able to increase them. Thus, in 2020, we may well see a few old-timers sitting there sending CW with their hand keys, just like they are now . . . and their grandfathers were 70 years ago. But the mainstream of communications will have passed us by. As commercial short-wave communications systems and broadcasting disappear we may be able to go back to spark on 200 meters, thus keeping alive the raison d'être of the American Radio Relay League. You can bet I'll be sporting my

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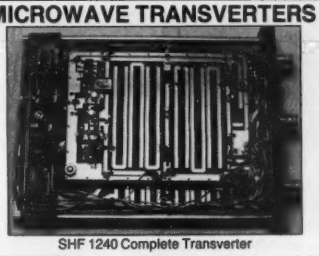

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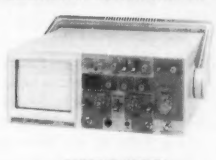

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``Nothing Endures Like Change"

The ancient Greek philosopher who said that wasn't speaking for amateur radio, where change is glacial, and fought bitterly. As Canadian Department of Communications official Peter Alien recently said, "Slow growth and a closed-shop mentality have led to the graying of amateur radio."

When I started hamming the entry code speed was 13 wpm and the technical exams were at about college level. In the late 1920s hams had to build their own receivers, since little was available commercially. As soon as commercial receivers were introduced amateurs stopped building them.

By 1938, when I talked with virtually every active ham in Brooklyn (NY), I was able to find only one ham who'd built his own receiver. We were still building our transmitters, not because building was fun, but because there were none available commercially. Not even kits.

After WWII we got busy converting military surplus transmitters, but it wasn't long before a wide range of commercial transmitters and kits appeared. That quickly put an end to around 90% of ham home construction. Pioneering hams still had to build VHF gear and gadgets for new modes such as NBFM, RTTY and SSB. But as soon as there were enough hams interested in a new mode, commercial gear became available and home construction blew away.

I built my first SSB rig in 1954. By 1959 Hallicrafters had a miniature transistorized sideband transceiver on the market which was far beyond anything I could hope to build. I made an around-the-world DXpedition in a MATS C-54 plane in 1959, operating SSB from 22 countries using Hallicrafters SSB equipment.

Old-timers can tell you about the bitter fights between AMers and SSBers in those days, as older amateurs fought change . . . and lost.

DOC's Alien laid it on the line, and not only for Canadians. ``How do we keep amateur radio from becoming extinct? Very simply, you've got to get out there and recruit new interest. Do everything you can to interest young people in ham radio. Advertise. Talk to people. Provide instruction and make it convenient for busy people. Could you convince your local high school to establish an after-school radio club, where a station can be set up? Could you convince school authorities to let you make 'Introduction to Radio Theory' a part of an electronics course?"

Amateurs today buy their equipment and get their enjoyment from using it. Perhaps our entry exams should reflect this reality.

When the first microprocessors became available, hobbyists built their own computers. Then, when commercial microcomputers arrived, hobbyists got busy building accessory boards for them. Soon there were enough users so just about any board you could imagine was available, so hobbyists turned to software development and hacking. These days computer hobbyists can't hope to compete with mass manufacturing economies or with the humongous commercial software programs, so they're busy playing ever more involved computer games and calling in on computer networks and bulletin boards. There are now over 46,000 bulletin boards in the US.

In amateur radio, though we enjoy reading about building, only a tiny percentage of hams are actually building. There no longer are parts stores in every city. Or in *any* city . . . at least in America. There are some great kits available, but even this activity has dwindled. Maybe you noticed that Heath finally had to give up trying to sell kits, marking the end of an era. And Eico is long gone.

Alas, our license exams still reflect the thinking of a long-gone era. Morse code, which is no longer used commercially in the real world, is still being used as a barrier to keep as many people out of our hobby as possible. Our technical exams are woefully out of step with the reality of amateur radio today. But then even the whole basis and purpose (97.1) for the hobby is out of date, as I've mentioned recently.

No, I don't know how to get the message through to the closed-minded old-timers who are killing our hobby. I hear them at our ham clubs angrily fighting change. I see them epitomized in the good old boys' club in Newington. Let's get some young ARRL directors, for heaven's sake! That doddering old bunch you've elected, still grasping their hand keys to their chests, are leaving deep heel marks in the sands of time as they fight change to the bitter end.

So here we are, fighting over the deck chairs, as our ship, which has collided with the iceberg of change, slowly sinks. Rout the old-timers from your club. If they have tight control, bring in enough newcomers to oust them. You have to be prepared for a fight because the old guard will try to throw you out.

There's an egregious example of this with the Algonquin Amateur Radio Club in Marlboro, Mass. I've written to the president of the club (K1ZFH) about his outrageous conduct, asking for an explanation. I got a brief note from him saying to contact his lawyer. Further correspondence from me has been ignored. My own feeling, often expressed, is that lawyers are brought into amateur radio matters only by scum. When the homosexual ham group sued *QST*, demanding their ad soliciting members be run, their strident leader went on my suer scum list.

We can't bring back the days of home construction. We can't bring back CW, other than as a small fun part of amateur radio . . . something some of us do because we enjoy it. We can't bring back AM. My workbench, with shelves of test equipment and a barn full of parts, is a memory. I enjoyed building my first narrowband FM modulator and installing it in my Meissner Signal Shifter. I enjoyed converting a BC-459 to 20m and adding an NBFM modulator. I loved building my pp813 kilowatt final. I got a whale of a kick out of building my RTTY converter, complete with a dozen or so 6SN7GTXs. But those things are memories and when I'm gone, they'll go with me. Those memories are no reason to try and force today's prospective hams to build their rigs. Or to learn the code.

The SCR-522s which helped stabilize 2m are all gone now. Even my big box of crystals for the rig is gone . . . sold off in an auction almost 30 years ago. But I still remember every detail of that wonderful old rig. And I'll never forget the thrill of making 2m contacts from the top of the New York News building in 1948; the top of the Municipal building in 1949; and the top floor of the Guggenheim museum building in 1951. Or the wonderful RTTY net we had on 2m at that time. Sure, I had to build my own equipment in those days. But as soon as the stuff was available commercially I stopped building, right along with everyone else.

So let's give some thought to where amateur radio is going. Let's talk about what services we can render. Let's stop worshipping the past and trying to preserve it in our rules and tests. If we can't pay back society in some way for the use of our frequencies in the 21st century, we're goners . . . and those old-timers who were fighting you are going to be little more than forgotten Silent Keys listed in the yellowed pages of old *QSTs* up there in the attic.

Sure, I've had fantastic times in amateur radio. Times I'll never forget. I feel sorry for hams who haven't taken the trouble to do ham things. For hams who've never been on a foxhunt. Who've never won a contest for their section. Who've never made any satellite contacts. Who've never made any aurora contacts. Who've never worked DX on 6m. Who've never mountaintopped on VHF.

I remember sitting in the back seat of my old 1940 Ford on top of Mt. Greylock in Northwestern Massachusetts with my old SCR-522 and a 14-1/2 element beam, making contacts all over New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, and Long Island with three college buddies back in 1947. We'd driven up there one very cold night after a ham club meeting and we had a ball. We swung the beam from inside the car with some string tied to the ends. The beam, tied to the top of my car, had lost 1-1/2 elements on the trip over.

These days all it takes is a tiny HT and I can make contacts through a hundred or so repeaters from any good mountaintop. That was exciting back in 1969, when there were only a few repeaters. I had an old Motorola HT-220 and was able work all over New England with it. My mobile 2m rig got me down to Maryland repeaters when we'd have morning temperature inversions. I hope you're building a lifetime of ham memories.

Oh, my first DXpedition! Wow! That was in 1958 and six of us went to Navassa. I'd gotten KC4AF for our call. I think I may be the only one left out of that group. The others died off or disappeared. I still have some great 16mm film of the DXpedition. But most important are my memories of every minute of the experience. The hurricane during our trip down where we almost ran onto a reef. The time we were almost killed by Haitian police. The pile-ups! The glorious, endless pile-ups. Running out of water. My having to dive in the shark-infested waters to retrieve the beam elements we'd dropped. The heat. The dangerous cliff we had to climb to get on that uninhabited island with no beaches.

My contact with Moscow via OSCAR VII, where we had only a 20-second window to make the QSO.

My wonderful visit to New Caledonia, where I worked the pile-ups for a week and got fabulous pictures of the island from a local ham's plane. And my aerial photos of VK3ATN in Birchip, Australia, and his 2m moonbounce antenna. I used to fly, but I had to sell my plane when I started *73*. And my boat, too. And my Arabian horse, and my Porsche. All that went into printing the first issue of *73* back in 1960. Fortunately, the magazine was in the black from the first issue . . . or else it wouldn't be here now. That's the way entrepreneurs are, they gamble everything on a new business.

Many times since then I've not known whether I'd be in business another month or not, but I've always managed to make it.

I remember the first time I worked all continents within one hour. And the weekend I worked 100 countries on 20m phone. And the night I worked all states on 75m AM. Other events may fade from my memory, but my ham experiences stand out clearly, even years later. My nights making contacts with King Hussein in his summer palace. My dinner with him, his wife and inlaws. Working SSTV from Navassa on my second trip in 1973 as KC4DX. Working SSTV from Jordan as JY8AA, and from JY1's station in his downtown palace. Setting up the JY73 repeater in Amman. Working my home station from YK1AA in Damascus, and then again from VK3ATN, where we shifted from 20m to 75m and my W2NSD/1 signal was still S9. The wooden ``mattress" and cold showers while staying with Father Moran 9M1MM in Katmandu. The friendliness of hams in well over a hundred countries I've managed to visit so far.

My advice to youngsters is to build your ham memories. Do everything you can in the hobby. Amateur radio holds enormous adventure for you if you'll just grab the ring as the merry-go-round turns. My 10 GHz contact with New York State from the top of Mt. Monadnock (NH), where I'd struggled to the top with a three-foot dish, just in case. The top of the mountain was in dense fog, so I had to aim the dish with a compass. Even though my tenth watt signal had to go over a mountain to

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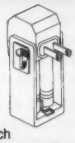

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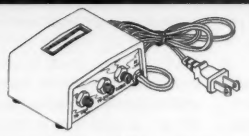

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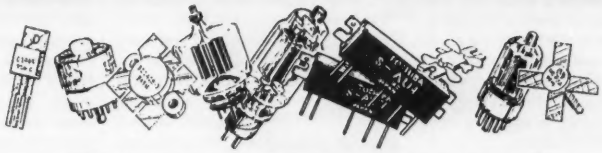

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C.O.D.: Add $4.50 UPS charge. Cash, Cashiers Check, Money Order, or Pre-approved Company Check only. No C.O.D. to Alaska / Hawaii / Puerto Rico / Canada.
FOREIGN: Bank check drawn on U.S. Bank, or VISA / M.C.
WIRE TRANSFER: Contact us for account information.
OPEN ACCOUNT: Net 30 to firms whose credit has been pre-approved.
FOREIGN: Insurance/Registration is often available. Advise if desired.
SMALL PACKET: Ideal Air shipment for small orders of parts. $10.00 up to 8 oz - 4 lb. max. 8"x8"x8" box.
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make the path, we made a good solid contact. There's no way I'll ever forget that moment. That was my seventh state on the band!

Work DX. Get good at contests. Collect certificates. Get on OSCAR. Do packet, RTTY, and SSTV. Do it all. You'll never regret a minute of it. Looking back on 56 years of hamming, I don't. Perhaps this is why I'm so strident about our coming to grips with change. Why I feel that we need to keep amateur radio in step with the times and not try to keep it a monument to a long-gone past.

Why Democracy has Failed

Yes, I know, if I say white, you automatically say black, so you're going to try and say that democracy has not failed in America. And I say ``baloney.'' I shouldn't have to remind you that the foundation of democracy is an informed electorate. Well, I hope you're not going to try and convince me that a country where less than half the people are interested enough to vote, and most of those who do vote on the basis of sound bites and political commercials on TV, is what our floundering forefathers had in mind when they set up this mess?

They thought they'd set up a citizen's legislature, not a new class of professional politicians whose dominating goal in life is to get as much money as possible from special interests so they can be endlessly re-elected.

The sorry fact is that there are so many complex problems today that it is completely impractical for the average person to find out what's actually going on. When I signed on as a member of the New Hampshire Economic Development Commission almost two years ago I knew I had a lot of work to do. Well, I dropped just about everything else and went to work. I read every book I could find on education, welfare, taxes, business growth, the international situation, creating jobs, health care, racial problems, crime, our prison system, stopping drugs, and so on. I attended endless committee meetings, have heard testimony from experts on a wide range of problems, and have attended a ton of conferences on exporting, defense conversion, job creation and so on.

Few people have the time and patience to do that kind of research. Yet, without it, how can any of us make informed decisions when it's voting time? How can we write to our representatives to give them our guidance if we don't know what we're talking about? We hear half and quarter truths from most of our politicians. We're at the mercy of political action committees and lobbyists with millions of dollars to invest in bribing Congress and our state legislatures. It's been well documented that we're getting left-wing bias from our media. So we sit here watching one exposé after another of corruption in savings and loans, banking, housing, defense contracts, health care ripoffs, government land scandals, farm and tobacco subsidies, and endless Congressional pork projects.

To listen to the liberals in Congress, there's no way to cut back on "entitlements." Yet, if they don't, the deficit is going to keep right on growing. Then there's the conservatives who want to set up a virtual dictatorship and control our every move. Phooey.

I Have a Solution!

Yes, I believe democracy is still possible! The electorate can still be informed, and without having to spend two lousy years trying to understand what the hell is going on with the endless messes Washington has created. Well, we're the guilty ones. We're the dummies who elected those crooks. We've let those bozos bamboozle us with emotional TV spots into giving them our checkbooks with all the checks pre-signed. We even elected Charmin' Billy from Arkansas.

So what's the out? Well, one way is to let fools like me do most of the work, digesting the mountains of conflicting trivia and giving you the results in brief readable form. A digest. And that's what I've been doing with my reports, which are sent to the New Hampshire Economic Development Commission, the Governor, and the Legislature. Each one is 16 digest-size pages long. Reading time is about 15 minutes. I'll be putting 'em on tape for people to listen to in their cars. Each report takes about 20 minutes to read out loud. I put 'em out twice a month.

You can let me do the homework . . . read the books, attend conferences and hearings . . . and tell you (a) what I've found out and (b) offer some creative solutions to the major problems facing us all.

All this can be yours for only $20 for 20 issues. A steal. Send me a $20 bill, a check, or your credit card information and I'll get you a bunch of my *Updates*. They'll give you plenty to talk about on the air, that's for sure. And, if you're even remotely inclined to make money, there's a wealth of entrepreneurial ideas in 'em. Send your $20 to Updates, WGI, Peterborough NH 03458-1107. Or fax your credit card info to 603-924-8613.

You'll be able to drive your family and friends crazy by knowing more about just about everything than they do . . . and by coming up with brilliant solutions to the problems. 73

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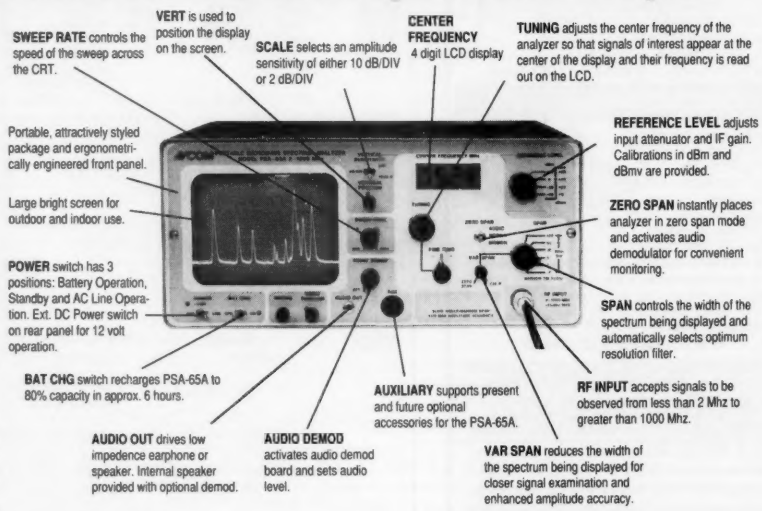
For more information, write, FAX or phone.


SWEEP RATE controls the speed of the sweep across the CRT.
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SCALE selects an amplitude sensitivity of either 10 dB/DIV or 2 dB/DIV
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TUNING adjusts the center frequency of the analyzer so that signals of interest appear at the center of the display and their frequency is read out on the LCD.
Portable, attractively styled package and ergonometrically engineered front panel.
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REFERENCE LEVEL adjusts input attenuator and IF gain. Calibrations in dBm and dBmv are provided.
ZERO SPAN instantly places analyzer in zero span mode and activates audio demodulator for convenient monitoring.
POWER switch has 3 positions: Battery Operation, Standby and AC Line Operation. Ext. DC Power switch on rear panel for 12 volt operation.
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RF INPUT accepts signals to be observed from less than 2 Mhz to greater than 1000 Mhz.
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The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the October classified ad section is August 12, 1993.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $7.95 each, ppd USA. Send to: **ALLABOUT BOOKS**, Dept. S, P.O. Box 22366, San Diego, CA 92192. BNB200

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QSL CARDBOXES & INDEX DIVIDERS. Send SASE. **7-Mike HAMSTUFF,** P.O. Box 14455, Scottsdale AZ 85267-4455. BNB224

ALINCO DJ-580 OWNERS: Improve UHF reception with varactor track tuning and extend your receive to about 508MHz. Up to 20dB sensitivity and image rejection improvement at band edges. Instructions, $25.00; Instructions and surface mount parts, $45.00. N2QMG, PO Box 843, Marlton NJ 08053. (609)988-1093 5-9 PM. ET. BNB230

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THE RADIO CRAFTSMAN, newsletter for those who want to build their own equipment. Send large SASE for sample issue, information. **AA0MS**, Box 3682, Lawrence KS 66046. BNB325

RCI-2950 OWNERS: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT,** P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

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Continued on page 81

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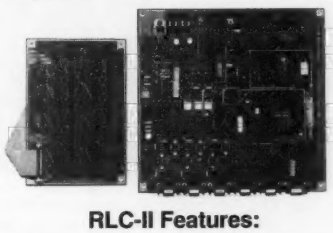

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NEW PRODUCTS

Compiled by Charles Warrington WA1RZW

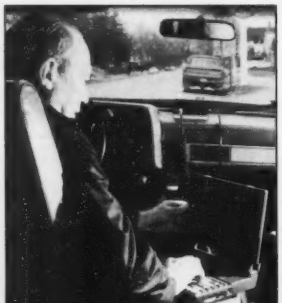
NEMAL ELECTRONICS INTERNATIONAL

Nemal Electronics International has introduced a new line of composite RF/control cables for use in two-way communications, and especially for amateur radio applications. The "HAM-CABLE" is constructed of a coaxial cable and an eight-conductor rotor cable with an overlay weather-resistant jacket. Available versions include RG8, RG8X, and RG213 for coaxial members with either standard 8C1822 or heavy-duty 8C1620 for rotor control. Part number HC100 consists of RG8 low-loss foam, together with 8C1822 and a black jacket. Other constructions and other colors are available by special order. For additional information, please contact *Nemal Electronics International, Inc., 12240 N.E. 14th Ave., North Miami FL 33161; (305) 899-0900, Fax: (305) 895-8178.* Or circle Reader Service No. 203.

MIDLAND LAND MOBILE RADIO

Digital hams will be interested in this new, built-in two-way radio modem. Midland LMR has introduced an internal modem for its Syn-Tech XTR two-way mobile radios and desktop base stations that provides a built-in data interface. With the internal modem a wide variety of data sources, such as GPS receivers and other vehicle location systems, vehicle sensors, mobile data terminals and PCs, can be plugged directly into the radio.

This integrated radio/modem design optimizes data communications performance and reliability, simplifies installation and saves space; no extra boxes are needed. The modem is capable of data rates up to 9600 BPS, with forward error correction, and supports RS-232 or TTL interfaces. For more information, contact *Midland LMR, Marketing Department, 1690 N. Topping, Kansas City MO 64120, or call 1-800/MIDLAND, Ext. 1690.* Or circle Reader Service No. 204.



THE TOOL RESOURCE

The Tool Resource has introduced a new No-Clean Wire Solder. The Alpha Telecore Plus No-Clean Wire Solder was developed to meet the highest demands that exist in electronic hand soldering. It leaves only a miniscule amount of optically clear inert flux residue. The development of this product is a result of the shift away from ozone-depleting chemicals that are used in electronics for batch or spot cleaning.

Telecore is a core solder that contains a Water White gum rosin base with an efficient activator system that promotes rapid solder wetting of board pads, component leads and terminations. Although this solder is designed not to need cleaning, it can be cleaned if necessary. For more information contact *The Tool Resource, P.O. Box 1106, W. Dundee IL 60118, telephone and Fax: (708) 468-0849.* Or circle Reader Service No. 202.

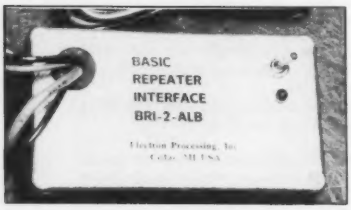
ZERO SURGE

Here is a new patented surge protector that never contaminates ground. The Model ZS1800 surge protector from Zero Surge provides fast suppression of power-line surges to protect microprocessor-based computers, networks, and peripherals. Rated at 15 amps, it eliminates spikes and surges without relying on commonly used MOVs (metal oxide varistors). As a result, this surge protector not only eliminates surges on the 120 volt hot wire but also keeps the power-line ground circuit clean, eliminating diverted surges which MOVs routinely dump onto the ground line.

Experts report that ground-line surges, especially in UNIX and network installations, can cause many mysterious problems, such as blown peripherals, keyboard lock-up, and lost or corrupted files. Zero Surge products never dump surges to ground, thus eliminating most of these problems before they can ever occur.

Unlike most other products, the ZS1800 reacts to surges and spikes instantly, diverting the surge to a capacitor bank which stores the unwanted energy. The unit gradually bleeds it back to neutral without damaging surge-energy pulses.

The suggested retail price is $199.95, and this product carries a 10-year warranty. For more information contact *Zero Surge, Inc., 215 Glenridge Ave., Montclair NJ 07042; (201) 744-1760, Fax: (201) 744-1804.* Or circle Reader Service No. 205.



ELECTRON PROCESSING

Hams needing a simple repeater interface that is easy to install and operate can now select a special ruggedized version from Electron Processing, Inc. This unit is right for use where either the RF or mechanical environment demand more than a standard enclosure.

The new BRI-2-ALB is housed in a strong cast-aluminum box that is only 2.5" x 4.5" x 1" in size. This new model contains all the features of EP's BRI-2, including a super-sensitive VOX, and both hang and timeout timers. In addition, a rugged transmitter keying relay is included which will handle up to 10 amperes of keying current at 230 VAC or 30 VDC! A passive audio matching circuit assures clean transmitted audio.

The BRI-2-ALB is priced at $70, plus $5 S & H. For further information, contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621; (616) 228-7020.* Or circle Reader Service No. 206.

HARLAN TECHNOLOGIES

Now, a new inexpensive method of copying slow-scan TV from Harlan Technologies uses software and a Sound Blaster compatible sound card with a PC. Slow Scan II will work with the Sound Blaster, Sound Blaster Pro, SB16, Pro Audio Spectrum 16, Fusion 16, and other Sound Blaster compatible sound cards. The program will copy Robot 8, 12, 24, and 36 second black and white, Robot 36 and 72 second color, and Scotty versions 1 and 2. All color modes display in black and white.

Slow Scan II will also re-transmit pictures that were received and can save them either as .VOC files or in the .PCX format. System requirements include a PC with a hard drive, a VGA monitor capable of 640 X 480 / 256 colors, and a Sound Blaster compatible card.

The price is $40 plus $5 S & H. (Illinois residents add $2.50 tax.) For more information or to order contact *Harlan Technologies, 5931 Alma Dr., Rockford IL 61108; (815) 398-2683.* Or circle Reader Service No. 201.

BARTER 'N' BUY

Continued from page 79

KIT BUILDERS! Complete list of 100+ kit vendors. SASE + $3.00 USD to: **RUDY RUTENBER,** 38045 10th St. E. #H75, Palmdale CA 93550. BNB365

OFFERED PEANUTS FOR YOUR TRADE-IN RIG? I pay cash! **RADIO RECYCLERS,** 7730 W. National Avenue, West Allis WI 53214. (414)771-7121. BNB400

WANTED: Schematic Siltronix model 1011-C, copy OK, reasonable fee. (704)333-9363 EST. BNB425

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QSL SAMPLES send $1 (refundable). Bud Smith, Box 1948, Blaine WA 98231. BNB475

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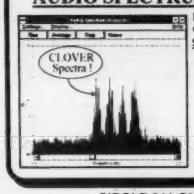

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Pioneer Hill Software
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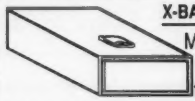

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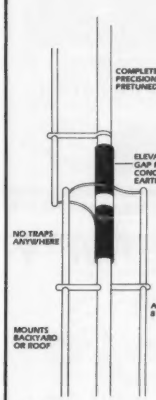

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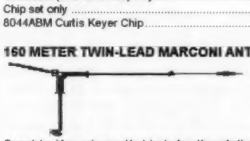

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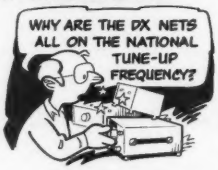

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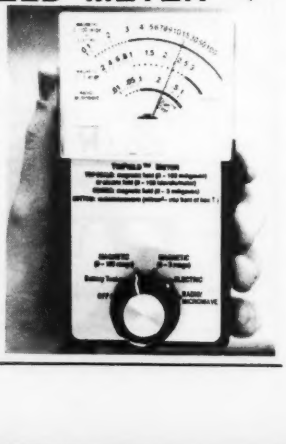

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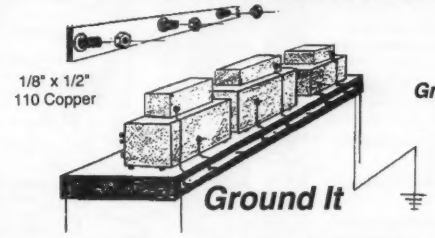

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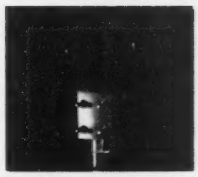

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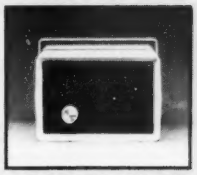

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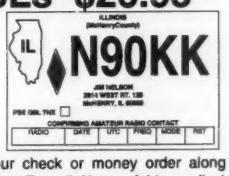

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RANDOM OUTPUT

David Cassidy N1GPH

Now that we've all had the chance to pat ourselves on the back about the success of the new Technician Class license, it's time to get back to reality. And, what is reality? Reality is that we still haven't changed our demographics much. Sure, we've added a gazillion new hams, and for the most part they are a credit to the Amateur Radio Service, but our median age is still closer to Social Security than high school graduation.

I've discussed this problem at length in this space. I've received lots of mail supporting my position that your average John Q. Ham *doesn't want* any more young people involved in this hobby, even though without them our future is tentative at best. Luckily, I've received an equal amount of mail from clubs who are actively recruiting youngsters. I even heard from a club member who is going to nominate a 15-year-old for club president at the next election. I hereby offer this young man's candidacy the firm support of this magazine.

So, we've added a whole bunch of new hams, but we're still no better off than we were three years ago. In fact, with the average age of a ham somewhere in the mid-fifties, and with our demographic of overweight smokers who are at a higher risk for cancer than the population at large, I'd be willing to bet that we haven't even made up for our mortality rate (remember that with the change to a 10-year renewal period, it is impossible to get an accurate count of actual licensees). The problem still exists, so what do we do about it?

The world of general aviation is very similar to amateur radio. Any of you involved with aviation know that the number of private pilots isn't increasing. With the lack of fresh blood, it gets tougher and tougher to fight the rather sizable contingent of folks who feel that only the government and the airlines should be allowed into the skies. Local airports are closing at about the same rate as that at which we lost our high school amateur radio club network back in the '60s and '70s. Of course, the fact that the local airport is the financial lifeline for a small community doesn't persuade those who would rather see condos or another shopping mall in its place. By the time the financial impact of closing the local airport is felt, it's too late. Without the industry and jobs that are supported by the existence of a local airport, it is not long before the community can't support the retailers in that new mall, and the town ends up with a vacant shopping mall where an airport used to be. Our fight for spectrum is very similar to general aviation's fight to keep the skies free. The only difference is that general aviation is doing something about the problem.

Recently, the EAA (Experimental Aircraft Association, an organization of homebuilt aircraft enthusiasts and one of the major organizations representing the average Joe Pilot) began what they call the Young Eagles Program. The premise is simple, but the consequences could be the saving of an entire industry. The Young Eagles Program has set a goal of giving 1 million children the chance to take a ride in a small plane by the year 2000. Local EAA chapters and other pilot groups, working formally with "Aviation Day" at their local airports, as well as informally with the young kid who hangs out at the airport fence, are introducing young people to the joy and freedom of flight. The theory being that once enthralled by flying, these kids will grow up to be at the least favorably diposed to general aviation, and at best they will go on to get their pilot certificate and join the rest of us. It is an absolutely brilliant program in its simplicity, and it is something we hams should think about.

Let's assume that about 50% of the hams on the FCC roles are alive *and* active. That's about 300,000 people. If each one of us would pledge to introduce four youngsters to amateur radio in the next seven years, that would be 1.2 million kids! If only a small percentage of those kids became interested and licensed, we would at least keep our numbers stable and we might even gain a few.

I'm not talking about sticking a couple of kids in the corner of your shack to watch you check into the local Old Geezers' Net. I'm talking about excitement! Assign someone in your club to be the Kids Coordinator for next Field Day. Get the kids involved setting up, camping out and making contacts. How about every club in the U.S. having a school that they "adopt"? Club members could donate or buy the equipment (what better way to spend the coffee kitty than to ensure the future of amateur radio?), set up a shack, teach after-school licensing classes, and a whole lot more. I don't think I've seen a club in 20 years that didn't have a high percentage of retired members, so getting school-hours help shouldn't be a problem.

Forget about CW nets and SSB ragchewing. Get the kids involved in ATV (imagine having high schools all over the country, each with their own ATV setup, all sending tapes and programs back and forth to each other). Make sure you get computers and packet involved. Remember, these kids aren't facinated by radio the way you were in 1948 when it was still a new and evolving technology. That doesn't mean there's no room for the tried and true. How about everyone in the club kicking in 20 bucks and buying a coupla' dozen cheap receiver kits? Get the kids slinging solder! Once they hear voices coming out of something *they* built, you'll have them hooked!

Can't swing the 20 bucks? How about helping them build a simple directional antenna and setting up Saturday morning foxhunts? Ten or 20 kids running around the local park, all trying to find a bunch of transmitters—sure beats the heck out of Saturday morning cartoons or cleaning out the gutters.

There are hundreds of facinating areas of amateur radio. All we've got to do is figure out a way to present it to youngsters in a way that will get them excited. Of course, before you can hook them you've got to bait the hook, and that's exactly what the EAA is doing for general aviation.

The EAA, AOPA (Aircraft Owners & Pilots Association) and a few smaller groups are working hard to save general and sport aviation. *That's* the big difference. These organizations are responsive to their constituents. What have we got? We've got one organization that is run by the very people and attiludes that are the problem, not the solution. We can't wait for the ARRL to help us, folks (though they are the logical choice for the organizers of such a program). We're going to have to do this ourselves. 73

Number 30 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

September should be the first really GOOD month for propagation in several months. You may expect to find more "Good" (G) days this month than usual. One reason, of course, is the autumnal equinox, which brings equal length days and nights and—usually—"Fair" (F) and "Fair-Good" (F-G) conditions for many days during the month. D-layer absorption is down, meaning that you can find decent daytime conditions on 30 and 40 meters, and the storm systems and static of summer have begun to subside. On the higher bands above 30 meters there will be quite good DX conditions from dawn to sunset (and beyond for 20 meters) on the days marked Good (G) and also Good-to-Fair (G-F) and Fair-to-Good (F-G) days. Look for short skip, long skip and DX on the 4th through 9th, 12th through 15th, 18th through 21st, and the 29th and 30th. The only Poor days (P) expected are the 22nd through the 26th. Rejoice! Eighty and 160 meters will start to become useful again from evening through very early morning hours, and DX opportunities should abound, as well as propagation across the USA with short, medium and long skip available. Remember that we are really sliding down toward the nadir of the sunspot cycle, and that the higher HF bands will begin to suffer when compared to the heydays of four and five years ago. However, one good thing to think about is that the 30, 40, 80 and 160 meter bands will really come into their own when all of the higher ones are shut down.

This month I want to talk about the method of using planetary alignment as a basis for forecasting ionospheric propagation. Occasionally you will find some of my comments on this subject appended to the monthly report. This month I'd like to quote from a book by Ivan Sanderson called *Investigating the Unexplained*, Prentice-Hall, 1972, page 130:

"A few years ago, the United States government gave a six-figure grant to one of the larger commercial complexes specializing in electric, electro-magnetic and related technologies to study, over a period of three years, the possibility and validity of suggestions that the 11-1/2-year sunspot cycle might be correlated with and thus responsible for erratic and anomalous radio propagation on earth. When the technologists' report was submitted, both officialdom and orthodox sciencedom received a considerable jolt. The findings were to the effect that, while such anomalies on earth did appear to show predictable rhythms, these did not seem to coincide so much with the detected solar periodicity *but rather with the movements of the planets, their conjunctions and oppositions and so forth.* The consensus was that the effects were produced by gravity rather than electromagnetic interference or boosting."

My own observations are that gravitational effects of the largest nearest planet (Jupiter) and the planets closest to earth (Mars and Venus) seem to have the greatest effect when their paths with respect to the sun form oppositions, conjunctions, and quadratures (90-degree angles) with each other and with earth. These observations are not mine alone, as considerable emphasis has been placed on such phenomena by other searchers. Exactly why this should be so is—as yet—unexplained, but I would suggest that gravitational fields play a large part, and also that the sun itself is in some way "modulated" by planetary influences, thus producing flares and other phenomena that are known to affect radio propagation on earth. If you consider that the sun and its planets may react as fluid-like masses rather than solids to gravitational "pull" or distortion, plus the fact that most of the planets have electromagnetic fields that interact with the sun's fields, we can begin to see that there are complicated interactions taking place. The earth is actually considered to be within the solarsphere and the sun's electrons and photons reach our planet in about eight minutes, while the larger and heavier particles take from several hours to a couple of days to reach us. These are captured by the earth's magnetic field and concentrated toward our North and South Poles, and we all experience the results.

By the way, in case you're interested, we have TWO full moons in September: one on the 1st and the other on the 30th. The autumnal equinox is on September 23rd at 00 hours and 22 minutes, just in case you wanted to know. See you next month. 73

EASTERN UNITED STATES TO:

GMT	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15*	20	20	20	-	-	-	-	-	-	-	15*
AGENTINA	15	15	20	20	40	-	-	10	-	-	10	10
AUSTRALIA	10	15	20	20	-	40	20	20	-	-	-	10
CANAL ZONE	15	40*	40*	40*	40*	-	20	10	10	10	10	10
ENGLAND	20	40	40	40	-	-	20	10	10	10	15	20
HAWAII	10	15	20	20	40*	40	20	20	-	-	-	10
INDIA	20	20	-	-	-	-	15	-	-	-	-	-
JAPAN	15*	20	20	20	-	-	-	-	-	-	-	15*
MEXICO	15	40*	40*	40*	40*	-	20	10	10	10	10	10
PHILIPPINES	-	-	20	20	-	-	20	15*	15*	-	-	-
PUERTO RICO	15	40*	40*	40*	40*	-	20	10	10	10	10	10
SOUTH AFRICA	40*	20	20	20	-	-	-	-	10	10	10	15
U S S R	20	20	20	20	-	-	-	10	10	15	20	20
WESTCOAST	10	15	20	20	80/40	80/40	-	-	-	10	10	10

CENTRAL UNITED STATES TO:

ALASKA	10	15	20	20	20	-	-	-	-	-	-	-
ARGENTINA	15	15	20	20	20	-	-	10	-	-	10	10
AUSTRALIA	10	15	15	20	20	40*	40	20	-	-	15	10
CANAL ZONE	15	15	20	20	-	40	40	10	10	10	10	10
ENGLAND	-	-	-	-	-	-	10	10	15	15	20	20
HAWAII	15	15	20	20	40*	40*	40	20	-	-	10	10
INDIA	-	20	-	-	-	-	-	20*	15	-	-	-
JAPAN	10	15	20	20	20	-	-	-	-	-	-	-
MEXICO	15	15	20	20	-	40	40	10	10	10	10	10
PHILIPPINES	15	-	-	-	-	-	-	20	10	10	-	-
PUERTO RICO	15	15	20	20	-	40	40	10	10	10	10	10
SOUTH AFRICA	20	20	20	-	-	-	-	-	10	10	15*	15
U S S R	-	-	20	-	-	-	20	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	10	15*	-	20	20	20	20	20	20	20	-	15
ARGENTINA	10	15	15	20	20	20	-	-	10	-	10	10
AUSTRALIA	10	15*	15*	20	20	20	40	-	-	-	-	10
CANAL ZONE	10	15	15	40/20	40/20	-	-	-	15*	10	10	10
ENGLAND	-	-	-	-	-	-	-	-	15	20	15	-
HAWAII	10	10	15	20	40*	40*	40	40	15	15	-	15
INDIA	-	20/15**	-	-	-	-	-	-	20/15**	15**	-	-
JAPAN	10	15*	-	20	20	20	20	20	20	20	20	-
MEXICO	10	15	15	40/20	40/20	-	-	-	15*	10	10	10
PHILIPPINES	10	10	-	-	-	-	-	-	20*	15	15	-
PUERTO RICO	10	15	15	40/20	40/20	-	-	-	15*	10	10	10
SOUTH AFRICA	20	20	-	20	-	-	-	-	-	10	15	15
U S S R	-	-	-	20	20	-	-	-	15	15	20	20
EAST COAST	10	15	20	20	80/40	80/40	-	-	-	10	10	10

*Try next higher band (!) Difficult path

SEPTEMBER 1993

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F	2 F	3 F-G	4 G
5 G	6 G	7 G	8 G	9 G-F	10 F	11 F
12 F-G	13 G	14 G	15 G	16 G-F	17 F	18 F-G
19 G	20 G	21 G-F	22 F-P	23 P	24 P	25 P
26 P-F	27 F	28 F-G	29 G	30 G		

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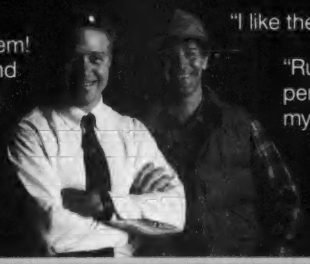

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